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ABSTRACT

This proceedings includes the following papers presented at the 16th International Essen Symposium: "Electronic Resource Sharing: It May Seem Obvious, But It's Not as Simple as it Looks" (Herbert S. White); "Resource Sharing through OCLC: A Comprehensive Approach" (Janet Mitchell); "The Business Information Network: Improving European Enterprise through Resource Sharing" (Sheila Corrall); "Cooperative Acquisition and New Technologies for Resource Management and Resource Sharing: An American Model" (Suzanne Fedunok and Sharon Bonk); "Information Networking Issues and Initiatives: The North Texas Experience" (Mary M. Huston and Robert Skinner); "Evaluating Electronic Resources: A Study Using Three Concurrent Methods" (Beth Sandore and Kathleen Ryan); "IT and Resource Sharing in Scottish Libraries together with a Note on Image Compression Standards" (Bernard Gallivan); "The Consortium of Academic Libraries in Manchester (CALIM): Strategic and Development Planning of a New Consortium" (John Blunden-Ellis); "Information Networking in the Nordic Countries: A Swedish Perspective" (Goran Skogmar); "The Nordic SR-net Project: Implementation of the SR/Z39.50 Standards in the Nordic Countries" (Jan A Laegreid); "New Developments in Standard Numbering" (Hartmut Walravens); "The Philosophical and Practical Dimensions of Resource Sharing" (David R. McDonald); "Resource Sharing in a Changing Library Environment: Strategies and Policies in a Canadian Research Library" (Frances K. Groen); "The International Library Market for CD-ROM Publications" (Klaus G. Saur); "Group on Electronic Document Interchange (GEDI): International Co-operation for the Electronic Exchange of Documents" (David Buckle); "Retrospective Conversion of Catalogues in European Co-operative Systems" (Michael McLellan); "Fuzzy Logic: Is It a Better Bibliographical Retrieval Method for End-Users?" (Peter Ahrens); "Advances in OPACs in Europe: An Overview" (Gitte Larsen); "Improving Data Quality in an OPAC from the '70s" (Sten Hedberg); "Integrating Images into the OPAC: Issues in Distributed Multimedia Libraries" (Jack Bazuzi and Ruth Wust); "An Image Is not an Object: But It Can Help" (David L. Austin); and "Conference Summary" (Kate T. Noerr). Most of the papers contain references. Abstracts only of the following two papers are contained: "High Performance CD-ROM Network Computing" (Gerold Ritter) and "New Ways for the Delivery of Information: IT, Networks, SGML, Multimedia and So on" (Arnoud de Kemp). The seminar agenda, lists of participants and participating vendors, and an index are also included. (MES)

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Edited by

Ahmed H. Helal
Joachim W. Weiss

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16th International Essen Symposium
18 October - 21 October 1993

Festschrift in honor of

Hans-Peter Geh

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16th International
Essen Symposium 1993

Essen University Library

Resource Sharing : New Technologies as a Must for Universal Availability of Information

18 October - 21 October 1993

Preface

The 16th International Essen Symposium 1993 was held at Essen University Library during the period from 18 to 21 October, 1993 with full registration of 120 participants from 16 countries. The goal of the International Essen Symposium is, as in the previous years and Symposia, to invite internationally recognized librarians, specialized in their field, to discuss new developments in concern with the topic of the Symposium.

This year the Essen Symposium was held in honor of Dr. Hans-Peter Geh, an internationally recognized authority on library cooperation, resource sharing, mutual understanding among all nations and free flow of information among the continents.

Dr. Geh is the chief librarian of the Württembergische Landesbibliothek in Stuttgart and Dean of the Library School Baden-Württemberg since 1970 to the present. During the years 1965 to 1969 he was head of the circulation department and head of the college of librarianship of the City and University Library in Frankfurt/Main. He is decorated with the "Bundesverdienstkreuz am Bande - Federal Cross of Merit" for his outstanding engagement and efforts in promoting and building up the collection of his library.

One of the spotlights in the career of Dr. Geh is the acquisition of one of the *Gutenberg Bibles*. In an auction organized by Christie's on the 7th of April, 1978 and within 27 seconds the transfer of the owners was perfect. For the Württembergische Landesbibliothek Stuttgart, which is by far the second richest library in its Bibles collection, was the new acquisition a remarkable enrichment.

The too many publications of Dr. Geh in German and foreign journals cover the fields of: education of librarians; conservation and preservation; library training; curriculum developments; and cooperation between librarians and publishers.

Dr. Geh is honorary member of many national and overseas library associations. He is currently·President of the European Foundation for Library Cooperation (EFLC) and is honorary Pesident of the International Federation of Library Associations and Institutions (IFLA).

He was the chief organizer of the 34th IFLA General Conference in Frankfurt/Main and since 1970 he has been an active member in IFLA in many positions: sections, divisions, professional board, executive board and from 1986 to 1991 he was the President of IFLA.

In his first speech as newly elected President of IFLA on the occasion of the 51st General Conference in Chicago he outlined a ten points program as his target in his capacity as the future President. The ten IFLA commandments, presented by Dr. Geh, were: the structure of IFLA; its professional activities; the core programs; its publications; the cooperation with UNESCO, related non-governmental organizations and other associated organizations and institutions; supporting the active participation of the Third World; the IFLA secretariat; and a look to the future; the individual member; and membership in general.

Dr. Geh is an international librarian. In all his activities, talks, speeches, presidential addresses, and in his capacity as IFLA President, he continuously stressed and underlined the role of IFLA on the international stage. Following are some of the issues which he addressed to the participants of IFLA General Conferences:

1988, on the occasion of the 54th IFLA General Conference in Sydney with the theme "Living Together: People, Libraries, Information" he appealed "not only to harmonious working together and mutual understanding on a national level, but also in the same way in international dimensions." Or, "... Such free exchange on information over and beyond national borders, the universal accessibility of literature and information in traditional and electronic means, as well as the preservation of cultural heritage in the form of the book are, therefore, the most important prevailing concerns of our international association." Or, "... Information may not be withheld from *any country and it is our duty to fight for this on the foremost front so that* the margin between "information-rich and information-poor countries" can be spanned as quickly as possible." Or, "... publishers and librarians have the same interest in this subject and, for me, close cooperation with publishers is also a particular concern." Or, "... we wish ourselves for the future in which books are easily accessible to an increasing number of people and in which the ability to read as well as the will and wish to reap the fruits of reading will be aspired to by all societies in ever stronger means."

On the occasion of the 55th General Conference in Paris, 1989 he defined the policy of IFLA in the following statement: "IFLAs policy has always been, in this connection, to stand for a free and unhindered flow of information ... and IFLA has been engaged with its full strength in the imperative cultivation of international librarianship in the spirit of international understanding."

Moreover, on the occasion of the 56th IFLA General Conference in Stockholm, 1990 with the topic of the conference "Libraries - Information for Knowledge" or the motto of the Swedish libraries "Lev livet läsande" (= Live your life Reading) Dr. Geh presented the following statement: "It is therefore the policy of IFLA to work constantly towards the goal of making information in libraries all over the world freely accessible to everyone, unimpeded by financial barriers."

Last but not least, during the 57th General Conference of IFLA in Moscow, 1991 which marked the end of his term as President of IFLA - which began 1985 in Chicago and covered the IFLA Conferences in Tokyo, Brighton, Sidney, Paris, and Stockholm - he was delighted about the significant political changes occurring and shaping the impact of IFLA on the international understanding.

1990, Dr. Geh supported the initiative of the program "Advancement of Librarianship in the Third World (ALP)" which led to an improvement on libraries/librarianship in these regions. In addition, his continuos support to the Bibliotheca Alexandrina is remarkable and worthmentioning in international cooperation and assistance to the developing countries. Dr. Geh outlined the needed support by saying "... now that the construction of the building seems to have been decided upon, I am mainly thinking of help in building up stocks and of giving staff training or continuing education. Let us support with all the means at our disposal an important project in a developing country which will provide not only this country but also many others in the Mediterranean region and the Near East with a great source of information."

The theme of the 16th International Essen Symposium was "Resource Sharing : New Technologies as a Must for Universal Availability of Information".

Access and not ownership is the resource sharing paradigm of the following decades as not a single library - national or academic - is self-sufficient and can acquire all materials requested by its users. This is more true at a time of constant or declining budgets. In addition, information technology is opening and improving new dimensions of gateway access even to remote resources. In no way the purpose of resource sharing should be understood as substitute and complementary issue to cover the continuos reduction in library budgets. On the contrary, as libraries are suffering from budget compression they are put under greater pressure to share their resources and developing new approaches to cooperative programs.

Cooperative collection development and resource sharing are essential cornerstones in librarianship and aim at all responsible librarians. There are too many publications about this topic attempting to outline, describe, and/or propose how to do it. However, there is no patent solution for cooperation and effective resource sharing procedures in the most effective way, i.e. to reach a high efficiency in resource sharing. This is a fact about the current situation even librarians had been working hard in the last decades to share their resources. As libraries cannot afford to acquire all the materials needed for research, only resource sharing brings libraries together for the benefit of the institutions local, regional, and on a national level.

The last two decades were characterized by a remarkable re-orientation for cooperative collection activities driven by the rapid evolution from print access to electronic access. The electronic resources provide libraries with opportunities for resource sharing and possible systematic cooperation in their collection building.

Cooperative collection building and resource sharing are the only way to meet the local needs over the long term. The spiraling costs of library materials, the appearance and rapid distribution of new electronic formats, and inadequate funding resources create new imperatives to depend on interlibrary loan procedures and resource sharing.

Academic libraries have traditionally shared their resources with other institutions in a number of different ways. There is a common consensus among all librarians that not a single library can acquire or support all material - in breadth and depth - for its users. Interlibrary lending and borrowing has long served the needs of faculty and students by dramatically expanding local collections.

The idea of resource sharing has existed for decades. Yet, even resource sharing is known and practicized since a long time, however, some librarians in the new lights of information technology and the rapid advancement still believe in networking facilities that library resource sharing is still in its early infancy. Not only academic libraries have developed tools for resource sharing but also bibliographic utilities such as OCLC have provided a wide range of services also designed for resource sharing and cooping with the information age.

Conspectus is in reality an adhoc approach form of cooperative collection development. It is by far the most successful service for academic programs. The philosophy is based on screening and zooming interdependent collections which are characterized by breadth and depth of coverage. Consequently, cooperating institutions in a consortium become accessible resources both for their libraries and possibly for the whole nation. This is and would be impossible for individual libraries to achieve on their own. In addition, this will minimize unnecessary duplication, broadening the availability of resources allowing more extensive and more economical access to collections and electronic resources.

New developments in information technologies offer new options in resource sharing which is becoming very important. Not only access services to catalogs, databases, etc. are the cornerstone of cooperative resource sharing but also document delivery procedures, copyright issues, economic balance between collection ownership and lender-net, etc.

The outcomes of the 16th International Essen Symposium 1993 are issues addressing contemporary resource sharing issues and covering topics which can be roughly grouped into the following headings: technology and resource sharing and perspectives on resource sharing. The proposals, results, and possible implementation are valid for all kinds of libraries. Issues such as effect of technology on resource sharing, document delivery procedures, collection development models, etc. are our daily hot topics.

As all libraries are suffering from economic circumstances affecting the development of collection building it is now their vital interest to consider seriously that cooperative collection development is the first step in the direction of resource sharing. The theoretical necessity and benefits of effective cooperative resource sharing are internationally recognized and accepted. This is more than true in the age of networking.

The 16th International Essen Symposium covered the possible use and implementation of new technologies for resource sharing and universal availability of literature. All the delivered talks are timely and applicable, and they reflect the impact of two important essentials, namely, the enhancement of modern technology and the noticeable decrease of funding resources.

In response to lack of funding for acquisitions and the noticeable increases in the number and costs of periodicals, especially the scientific, technical, and medical periodicals, we librarians were forced to show interest in cooperative collection development for the sake of resource sharing.

The ideas represented deal in large part with practical applications as the costs of operating academic libraries are escalating and there is a rapid progress in digitizing information in electronic libraries. All librarians have to work together to ensure and make benefit of all possible new technological developments.

Resource sharing does not only mean interlibrary loans, i.e. lending and borrowing procedures, but also includes the area of the preservation of library materials. The broadening of the definition of resource sharing in the context of preservation is in fact one of the exciting areas in cooperative library developments. There are many regional and national programs for cooperative preservation at least in the form of microfilming of library materials.

In addition, and recently, most of the preservation programs are broadened by the application and implementation of new technologies. Digital scanning, optical computing, declassification processes, etc. are only just examples of cooperative preservation activities followed by groups of libraries on regional and/or national scale. Within the next years it will be possible to capture, preserve, and even to scan microforms (microfilm and microfiche) onto disks. We are now in a position to transfer the interlibrary loans from hard copy to electronic display (but in no way decreasing the volume of interlibrary transactions!).

The advantage that technological resource sharing and access brings to us is not only greater economy, or even most efficiency, but cost effectiveness. In reality, technology has always been well ahead of our opportunities to utilize it and we librarians have to stress more on the value of electronic resource sharing than on figures in relation to increase in circulation or holdings. Advanced technologies today offer chances to create true access and resource sharing networks.

Planning for resource sharing in the electronic environment must be large scale and of multi-year dimensions, and not micro-management, because this is an area that cannot be funded one year at time. The needed additional costs cannot be absorbed through allocation of funds as it is not cheap.

Electronic resource sharing and access are absolutely essential and necessary for academia. As it shows us a way forward for economic transmission of information between libraries. This is true, particularly with the development of hydra technology which combines scanning, photocopying, faxing and printing.

Most of the papers given stressed on the importance, ways, and new developments in information technology and its effect on electronic resource sharing which provides great opportunities for libraries in allowing a much greater access to its holdings. The lectures covered a bundle of topics such as: Electronic resource sharing; Evaluating electronic resources; Resource sharing through OCLC; Cooperative acquisition and new technologies for resource management and resource sharing; IT and resource sharing in Scottish libraries; Information networking issues and initiatives; High performance CD-ROM network computing and new ways for the delivery of information; Integrating images into the OPAC; Issues in distributed multimedia libraries and new developments in standard numbering, etc.

A very interesting project is the initiative GEDI (Group on Electronic Document Interchange) as eight interested library related organizations expressed their wish to facilitate electronic document interchange between the GEDI partners. The partners representing institutions in the UK, France, Netherlands, Germany and USA defined a mutually accepted technical framework which encompasses existing ISO open standards to make the electronic exchange of full texts of documents possible. The developed framework is a standard for electronic document interchange. The pioneering character of GEDI lies in the willingness of the participants to apply standards recognized by national and international standards bodies.

Not only technology will ensure improved information access but also the implementation and application of standards will assure greater functionality to end users. Standards for the identification and retrieval of documents is in fact the most efficient tool to provide access to documents. Vocabulary standards, for example, must consider language differences, variant titles spelling, attributions, etc. Standard numbering has proven to be a most efficient search and identification tool for publishers, book trade, and libraries as extension of the international standard numbering system is a must.

The Online Public Access Catalogs (OPACs) are more than just reflecting and showing another version of the local library catalog. OPACs were installed in libraries as components of standalone integrated systems. Recently the wide spread of online access to databases via networks underlines the importance of online catalogs. The new developments do not only allow network access but also document ordering as well as delivery.

It is common for patrons by searching or browsing in OPACs to follow the linear fashion. In formulating their queries they restart to the top menu to start over again. In addition, not all the users understand the difference between searching by subject or keywords as access points and in combination by using Boolean operators. The most heavily used search access point is usually the keywords or phrases which is an uncontrolled vocabulary subject search. Consequently, most of the users have difficulties getting the desired hits by using the keyword search option. Recently, weighted retrieval was demonstrated to be an effective alternative to Boolean searching.

The new developments in OPACs make library resources accessible for libraries and end users via public and academic networks extending access to scholarly information resources beyond the local institution and improving the information infrastructure for academia. The identification, transmitting requests, ensuring speedy response, and delivery of documents by the holding library will be possible in reasonable time and cost effective. This can be by fax, Internet, etc. It is worthmentioning that Internet has revolutionized research and the access points in which researchers access information and making research results available to all who can access and benefit from them.

Joint online union catalogs make the resources of the participating libraries available to all their users. In addition, all advances in shared automation make cooperation possible and knowing what each library in the cooperative holds.

One of the key problems in resource sharing is the problem of lending. This is very clear, particularly within consortia with too many libraries of different sizes. In other words it may happen that one or more libraries will play the role of net lender(s) and their resources are flowing in one direction. In spite of that we librarians, however, are in agreement in accepting the impossibility of self-sufficiency and our hope lies in resource sharing even among unequal partners. The restriction of resource sharing among relative equals is not in the lines of the philosophy of resource sharing and the communality of interests.

Interlibrary lending and borrowing has long been in practice serving the needs of the users. Its dramatic expansion forces us to find new ways of cooperation backed up by the existing high-tech information technology tools. The costs of interlibrary transactions are in the staffing carrying out the operations. About two thirds of the costs are covered by the borrowing and one third by the lending library. The average cost per transaction is about US $ 30. All libraries are trying to offer photocopies rather than sending the original items. There is a noticeable replacement by photocopy, fax, or if possible through digital delivery. However, the major change in document delivery will be the possible and available access points. Electronic text delivery to the end user is already in practice.

There is now a new tendency, namely to buy rather than borrow which is an indirect enrichment to the collection of the library. However, the purchasing price, processing, cataloging, etc. are in fact much higher than the costs of an interlibrary loan transaction. In addition, the potential use of an item is the relevant decision and decisive element to judge the value of ownership or not, i.e. the present and future possible use intensity.

In conclusion, although cooperative resource sharing and cooperative collection building have existed for decades a patent concept is not yet existing. The revolution in information technology makes it necessary to keep on adaptation. Other issues such as improvement and accelerating the interlibrary loan procedures and very recently the highly welcomed cooperative preservation programs are such ones of the too many aspects of cooperative resource sharing. The practical dimension of resource sharing is not a new phenomenon among libraries.

The limitations of resource sharing lie in the understanding of the senior administrators, faculty, and librarians and their vision of what cooperation and resource sharing can accomplish. Cooperation and resource sharing may run into problems if they are lacking the faculty involvement and the support of the university administrative approvals. They have to be informed about mechanisms of resource sharing and the economics of consequences.

Librarians who are the most important information providers should play an important role in shaping the national information policy. They must make sure that administrators should understand that the massive electronic resource sharing is possible and desirable and will be cost effective. However, this will not be cheap and requires considerable additional funds.

The impact of enhanced technology, cooperative collection building programs, and decreased funding will force us more in the direction of even more rapid developments and achievements in resource sharing to meet the increased end user access through the Internet.

In short, all participants are in agreement that the salient results of the Symposium can be summarized in the following: "... Access, rather than ownership, is the resource sharing paradigm of the future; electronic resource sharing is a cost effective necessity as we face the future."

As the previous Symposia, the 1993 Symposium gave all participants, speakers, and vendors the utmost opportunity to keep informed about any progress, innovation, and/or new methods introduced. This publication, volume 17 in the series *Publications of Essen University Library*, may provide colleagues interested in the topic "Resource Sharing" with additional readings.

On behalf of the organizing committee of the Essen Symposia, we would like to extend our sincere thanks and appreciation to all speakers, participants, and vendors who added to the success and encouraging its continuation. Moreover, and in the name of all who attended the Symposium, it was a pleasure and honor for all of us to have Dr. Hans-Peter Geh as honorary guest. He is one of the great international librarians who actively shaped the activities of IFLA and offered a lot of support to the international activities and hope for the developing countries.

Essen, January 1994

A. H. Helal

J. W. Weiss

16th International
Essen Symposium 1993

Essen University Library

Resource Sharing : New Technologies as a Must for Universal Availability of Information

18 October - 21 October
1993

Agenda

Monday, 18 October

10.00 Registration
11.00 Vendors presentation

14.00 Opening of Symposium
Ahmed Helmi Helal

Chairman: **Ahmed Helmi Helal**

14.15 Electronic Resource Sharing :
It may Seem Obvious, but it's not as Simple as it Looks
Herbert S. White

15.00 Discussion
Coffee

15.45 Resource Sharing through OCLC :
A Comprehensive Approach
Janet Mitchell

16.15 Discussion
Coffee
Vendors presentation

19.00 Reception

Tuesday, 19 October

Chairwoman:	**Susan B. Aramayo**
9.30	Panel Session
10.30	The Business Information Network : Improving European Enterprise through Resource Sharing **Sheila Corrall**
11.00	Discussion Coffee
11.45	Cooperative Acquisition and New Technologies for Resource Management and Resource Sharing : An American Model **Suzanne Fedunok / Sharon Bonk**
12.15	Information Networking Issues and Initiatives : The North Texas Experience **Mary M. Huston / Robert Skinner**
12.35	Evaluating Electronic Resources : A Study Using Three Concurrent Methods **Beth Sandore / Kathleen Ryan**
12.55	Discussion Lunch break
Chairman:	**David Raitt**
14.30	IT and Resource Sharing in Scottish Libraries together with a Note on Image Compression Standards **Bernard Gallivan**
15.00	The Consortium of Academic Libraries in Manchester (CALIM) : Strategic and Development Planning of a New Consortium **John Blunden-Ellis**
15.30	Discussion Coffee
16.15	Information Networking in the Nordic Countries : A Swedish Perspective **Göran Skogmar**

16.35 The Nordic SR-net Project : Implementation of the SR/Z39.50 Standards
Jan A. Laegreid

16.55 New Developments in Standard Numbering
Hartmut Walravens

17.15 Discussion
Coffee

19.30 Reception

Wednesday, 20 October

Chairwoman: **Margaret Beckman**

9.30 The Philosophical and Practical Dimensions of Resource Sharing
David R. McDonald

10.15 Discussion

10.30 Resource Sharing in a Changing Library Environment : Strategies and Policies in a Canadian Research Library
Frances K. Groen

11.00 Discussion
Coffee

11.45 The International Library Market for CD-ROM Publications
Klaus G. Saur

12.15 High Performance CD-ROM Network Computing
Gerold Ritter

12.35 Discussion
Lunch break

Chairman: **Ronald M. Schmidt**

14.30 Group on Electronic Document Interchange (GEDI) : International Co-operation for the Electronic Exchange of Documents
David Buckle

15.00	New Ways for the Delivery of Information : IT, Networks, SGML, Multimedia and so on ... **Arnoud de Kemp**
15.30	Discussion Coffee
16.15	Retrospective Conversion of Catalogues in Co-operative Systems **Michael McLellan**
16.45	Fuzzy Logic : Is it a Better Bibliographical Retrieval Method for End-users? **Peter Ahrens**
17.15	Discussion Coffee
19.00	Reception
	Thursday, 21 October
Chairwoman:	**Genevieve Clavel**
9.30	Advances in OPACs in Europe : An Overview **Gitte Larsen**
10.00	Improving Data Quality in an OPAC from the '70s **Sten Hedberg**
10.30	Discussion Coffee
11.15	Integrating Images into the OPAC : Issues in Distributed Multimedia Libraries **Jack Bazuzi / Ruth Wüst**
11.45	An Image is not an Object - but it can Help **David L. Austin**
12.15	Discussion
12.30	Conference Summary **Kate T. Noerr**
12.45	Close of Symposium

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Electronic Resource Sharing : It may Seem Obvious, but it's not as Simple as it Looks

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Abstract

There can be no doubt that electronic resource sharing provides great opportunities for libraries in permitting a much wider access to information for the library's clientele. There can also be little if any doubt that these opportunities will enhance both awareness and demand. They will therefore tend to be cost effective and even cost beneficial, but certainly not cheaper than earlier alternatives, and this is particularly true if faculty and researchers are permitted simply to add these new opportunities to their more traditional methods of demanding full sized copies in their libraries. The unwillingness of academic administrators to recognize and deal with this issue of additional cost suggests the danger that librarians will be expected simply to "absorb" these additional costs through reallocation. The paper argues for the need for total and comprehensive planning instead of a piecemeal approach of considering only specific technological options, and for including organizational management in these decisions and responsibilities.

At last year's conference at which I was honored to be invited and recognized, I ventured some predictions about the opportunities and dangers in serving library users beyond the year 2000. I am further honored to be asked to make additional comments at this conference. This conference, as you know, deals with the possible use of new technologies for resource sharing and universal availability. As I look at the titles of some of the papers I look forward to hearing, I am struck by the fact that they deal in large part with practical applications, and I have no doubt that they will be informative and helpful. Nor, of course, do I have the slightest doubt of the impact that technology can and should play in the way we access and share information, or of the certainty that this provides tremendous opportunities for improving the communication of information in a world whose thirst for knowledge will probably never be slaked. My concern is with the political implications of all of this, and most particularly with the lack of clear understanding that surrounds the phrase "virtual library". I must confess that much of the thinking that went into this paper was triggered by last year's presentations by Barbara von Wahlde, Dick Dougherty, and Maureen Pastine. It struck me then, and to an even greater extent now, that "virtual library" has become for many outside our own profession, and perhaps for some inside it, a buzzword slogan. Everyone is in favor of it, nobody is prepared to pay for it (or even worse, insists that somehow the costs can be absorbed or shifted), and few people outside our own field have the vaguest idea of what this means. My alarm is then triggered by recalling the old saying variously attributed to Mark Twain, Will Rogers, and Josh Gibbons. "It isn't what we don't know that causes all the trouble. It's what we do know for a certainty, except that much of what we know for a certainty is wrong."

I have attempted no literature survey, but simply my own observations lead me to conclude that there are many assumptions about the virtual electronically shared library that, if not wrong, are at least simplistic. If not simplistic, they at least assume basic changes in human behavior patterns for which we have very little indication. If there is one thing we understand, it is that individuals will try very hard, whenever possible, to adapt their environment to their own preferences, rather than adapt themselves to their environment. And, indeed, they should. Sometimes technologists, or those subsumed by their awe of technologists, make assumptions about people that are simply not valid. We now find increasingly that certain online capabilities are not being used, at least by nowhere near the number of users projected. It was assumed that if a service were available everyone would want to use it. We forget that people prefer to do what is convenient to them, and that they will continue to do this. Librarians working with time-dependent clienteles in industry have know for some time that when information is not available either in a convenient format or within the time frame demanded, we are perfectly capable of denying that any information exists at all, even when we know it does.

My first concern about the assumptions that come with the technological library is the assumption that this will somehow require less space for the library itself. I have seen that argument put forward in such diverse settings as the planning for a new public library in my home community, and in library building discussions now taking place on several University of California campuses. The future library, it is argued, will not need to be nearly as large, because it will require far less physical materials on site. All we will need, for the most part, are some self-service terminals and screens on which information can be displayed - anything from anywhere. It is of course an exaggeration, but something like this is at least possible, but only if that is what people want. We will recall the predictions for a paperless society by Wilfred Lancaster.[1] Lancaster was correct in stating what could happen, but he was totally wrong in predicting what would happen. We now all know that computers are gigantic producers of paper, in part because they can do so easily, rapidly, and relatively cheaply, but in large part because it turns out that we like the safety and security of paper. Just about all of the faculty terminals in our offices have printer attachments, and I know of individuals who routinely print out all of their e-mail messages, so that they can scan them later at their leisure. Then, perhaps, they throw them away. As architects and the public and academic administrators who plan for library needs (frequently without asking the librarians) plan for smaller buildings, they perhaps do so on the shaky premise that what is possible is therefore going to happen. The attraction in the presumed reduction in costs, or at least the transfer of costs from acquisition to resource sharing, is something about which I will speak in greater detail later. However, the premise is at best dubious, because we have been extremely careful not to disturb faculty in particular by suggesting that libraries will perhaps not have large collections of several million volumes as we switch the emphasis from physical to electronic storage and that we will substitute additional electronic availability. There is nothing necessarily wrong with not telling them, but it makes both the premise of space and cost reductions highly dubious. We are certainly already in a position to transfer much of what we call interlibrary loan from hard copy to electronic display. However, the quantity of physical documents supplied continues to increase, even as everything else also increases. Indeed, technology has given us new and improved ways to produce paper, for storage or perhaps later disposal. I am talking about the FAX machine, simply another technology that produces paper.

If it is assumed, therefore, that technology will reduce the physical space requirements of libraries, nobody has yet discussed that issue with library users, and my concern is that the space will be reduced without anyone talking to them, with us then left with the unpleasant task of explaining someone else's bad decision regarding the library. Has it happened before? Countless number of times. There is still, to this day, a great reluctance to discuss unpleasant news with academic faculty members, and if the examples I am about to cite for you sound nasty, please remember that I am talking about a group of which I am myself a member.

In 1992 the Mellon Foundation reported the results of a three year comprehensive study in a volume entitled "University Libraries and Scholarly Communication", published by the Association of Research Libraries.[2] Since the researchers did look at the various implications of both technology and resource sharing, it would not have been an unreasonable hope that they would make some significant recommendations to their fellow academicians. Instead, they noted that scholarly publication is tied to prestige, and that this tends to make scholars more conservative. The study warned against unwarranted automation, without really defining what that meant and, after noting a wide range of ways in which scholars use information from their academic libraries, left the matter simply there, and without suggesting what might or might not be reasonable.

It is this continued unwillingness to choose among alternatives that leads to my second concern - that the virtual library we are about to create will probably not substitute electronic costs for publications costs, but rather substitute them for the publications costs we are no longer paying in any case, because we could no longer afford to do so. If there is going to be a faculty willingness to voluntarily forego ownership for access, to forego physical possession in the institution of the journal in which I have published or might someday perhaps like to publish, there has been no indication of this. It is therefore essential, I think, that librarians make sure that administrators understand that the massive electronic resource sharing which is not only possible but indeed desirable will be cost effective, but that it will not be cheap. It will require additional funds, considerable additional funds, and of course it is the responsibility of the university president, not of the librarian, to either find the money or explain why the opportunity will have to be missed.

Before I return to this theme, let me just posit my third concern, and this is one that I have addressed here last year - that somehow all of this technology will be easy for the end user, when of course we know, or at least should know, that the world of information intermediaries is growing with tremendous rapidity. An article in June of 1993 in the British journal The Economist, after noting the tremendous growth of the information service sector (without once mentioning libraries) even uses a term to describe this specialization I had not seen before.[1] In addition to hardware and software, customers are able, and are increasingly willing, to acquire a third commodity. The article calls this meatware, the purchase of the intellectual labor with which to use the hardware and the software. I recall mention at last year's conference of the emerging strategy within the Association of Research Libraries (ARL) of seeking a role of information advisors, who will counsel the end user in how to do his or her own information searches. However, human behavior studies would suggest that before we seek or accept advice, we would like some assurance that the individual providing the advice has the capability to do what is being talked about. Symphony conductors do not emerge from thin air, they have paid their dues as recognized and respected instrumentalists. If advisers emerge they will do so from honored and trusted intermediary meatware specialists, not from thin air.

My concern, then, is not that we will lack the technological opportunities to create true access and resource sharing networks. In our business the technology has always been well ahead of our opportunities to utilize it. There will of course be issues that require adjustment, and particularly these are issues of ownership, copyright, and downloading. These are "only" economic issues, and I use the word only because I believe, along with Peter Drucker, that of all of the resources money is still the easiest to obtain, provided that we deal with products and services that people really want. In such an environment cost becomes irrelevant, and the money is found, perhaps at the expense of something else. In the United States alone the annual level of expenditure for video games has now passed $65 billion, and video games are hardly as important to health, safety, and economic prosperity as the things we are talking about at this conference.

It is my concern that the technology will move us rapidly forward, and the movement is certainly rapid, before the issues of the economics of this process have been discussed, and the responsibilities allocated. And, let me state quite clearly, the responsibility is not that of the librarian, but of the individuals to whom both the librarians and the faculty members at least nominally report. There are choices here, and they must be carefully spelled out and priced, so that decisions can be made.

We should certainly understand that issues of economics are usually more of a process of style than of reality. Without wanting to point a finger at any country and any political party, because these tactics are endemic, I would note only that just about a month ago a plan was unearthed in the United States which promised to reduce the federal work force by over 200,000 employees.[4] How this was to be done was left vague, with suggestions of attrition and retirements, and that was wise, because none of this will ever happen. It will never happen because it can't happen politically. All administrations rail against waste and high taxes, but they also rail against unemployment, and perhaps wasted labor is the price of high employment. Certainly, if there had been a real desire to reduce the federal work force by 200,000, it could have been done easily enough. Let me try a sample announcement to show you how simple, and yet how impossible, this is. "We are reducing the government work force by 200,000 people. The individuals have been selected, and termination notices to each of them are now in the mail. They will be gone within the next month. We selected these individuals by the simple expediency of doing computer searches on their job descriptions, and eliminating all employees who ostensible had roles as coordinators or facilitators. We have done this, because we know from the work of Tom Peters, Gifford Pinchot, and Peter Drucker, that facilitators and coordinators don't really do anything except to create more work for other people."

Why have I told you this rather fanciful tale? In part to point out that the promise of economy in a political environment is enough, and that there is no real need to ever produce any economies. People forget. However, this issue of living in a never-never world is particularly significant for the academic environment in which so many of us live. In 1986 Howard Bowen and Jack Schuster published another study, based on four years of data gathering, this time sponsored by the Carnegie Corporation, under the provocative title "American Professors: A National Resource Imperiled".[5] I will not do the eloquence of the study justice when I tell you that the basic conclusion was that professors were found to be intelligent, well-educated, hard-working, productive and honorable, and that they were also unappreciated and underpaid. If academic and government library administrators are also so treated, nobody has yet been willing to undertake a study to tell our bosses.

My point in this paper, so early in the conference, is very simple. In the sessions which follow we will learn about many new and exciting opportunities. In talking about these, let us not forget about the money without which none of this can rightly happen. If we talk about the opportunities and not about the price tag, then we will somehow be saddled with the job of finding a way to finance something that cannot and should not be funded through reallocation. Economies in the process of scholarly communication are of course possible, but those economies depend largely on the activities of two other bodies, scholarly publishers and academic researchers, and what inconveniences or even just changes in work style they might be willing to adopt for the sake of economy. At this point I see virtually none of this. Could we be left holding the bag? It has happened before.

Let me suggest a simple mini-tutorial of the management process. It is the responsibility of subordinates, and certainly this includes us, to examine options and alternatives, to spell out the pros and cons of each of the alternatives, and to make recommendations. It is the job of our bosses, and we all have bosses, to make decisions based on those alternatives, and then to take responsibility for those decisions. What this means is that if there is faculty insistence on procedures and value systems that cost money, then the president gets to decide whether to find more money or to discipline the faculty. Either alternative, but only those alternatives, can be acceptable to us. "You figure out a way because I don't know how" is not an acceptable phrase of downward management communication.

Costs of information access systems can be considered high, although the word high is relative. Compared to what? Most certainly the overall cost will go up, because opportunities increase, and with opportunities expectations also increase. We now insist on having what we did not even know was possible. The advantage that technological resource sharing and access brings to us is not greater economy, or even cost efficiency, but cost effectiveness. If something costs twice as much but produces five times as much, and if we need and want it, then this becomes a bargain. The organizations that sell us things understand that well enough. That is why products can be bought by the case, or at least by the large bottle, and why wine is not sold by the mouthful.

Everyone is in favor of cost effectiveness, but we have not been particularly competent in making the case for the value of what we do instead of simply the activity itself. For libraries, both circulation and holdings are poor justifications because they deal with the activity rather with the purpose of the activity. As budget crunches continue for those not adept at defending themselves, the problem can get worse. All of my examples come from my own country, but I suspect the application is universal. In one public library setting it has been suggested that the library should charge clients for reference service, but this suggests to me the question of why we purchased the collection in the first place, unless we planned to maximize its use. In a report issued by the Urban Libraries Council, it is stated that the pressure is on libraries to forego education and training, to allow the doors to be kept open longer. And what is supposed to take place inside those open doors? Doesn't that matter?

Peter Drucker has suggested that service professionals are addicted to the moral imperative, to the belief that somehow with or without money we have to do everything or it will be our fault.[6] Drucker does not mention librarians, but I suspect that the description fits. Astute manager that he is, Drucker also notes that the strategy of moral imperativists is self-defeating, because if they take the blame on themselves, then nobody will ever give them any money.

If I see reasons for concern in this for our own field, I think there is good cause. And that is the message I bring to this conference. By all means let us examine the opportunities and economies of effectiveness that resource sharing and automation bring us. Let us make our recommendations bases on what, in our professional judgement, would be best for our parent institutions. However, let us not forget about the money. This process will cost more, and it is not money that can be totally reallocated, even if we were totally free to make all kinds of reallocation decisions. So by all means talk about the cost. But identify it as an opportunity costs, and as a fantastic bargain. Ultimately, if you manage them properly, your bosses really have no option but to pay for this, because it makes sense.

We cannot promise to bring proposals that cost no additional money. We can only promise to bring proposals that we believe make sense in terms of the mission of the institution as it has been articulated. Implementing that mission requires, in our professional judgement, that the things we are proposing must be done, and must be funded. If that ends up costing more, we can only state that we can demonstrate that it is worth it, and that there is really no choice unless this institution wants to relegate itself to obsolescence.

If academic administrators are concerned about money, and of course they are, there are probably even some economies we can suggest for their consideration. They would, in our opinion, save money without a significant deterioration of the academic institution. However, they involve decisions we cannot make and authority we do not possess. They involve a reassessment of ingrained values and ingrained habits, and for these the only virtue may be that they are old and comfortable. Certainly, when Bowen and Schuster dismiss potential discussion of what might be academic ineffectiveness with the argument that this is just the way professors are, they leave very little room for any further debate.

None of this would be particularly significant for us, because after all others can be inefficient if they want to be as long as it does not affect us, except for the fact that it does affect us. Funding agencies, in part because of genuine money shortages, and in part because of a disenchantment with what the academic sector has long promised but rarely delivered - quality of life and high employment - are making things still more difficult for the academic institution. Even during the so-called good times, which we now historically know to be the 1960s and 1970s, there was a tendency to think of the library as a place and as a collection, or, if you prefer to be eloquent, the heart of the university. Librarians themselves, their selection, qualification, pay, continuing education and training, and support for needed equipment, have all taken a back seat. If we now find the opportunity for electronic resource access, the so-called virtual library, defined simply as nothing more than an even larger collection without any other sort of adaptation of research and information use style, then it is not difficult to see that in the future the pressures on all of the things that librarians do that are not directly connected with the acquisition of material, whether in hard copy or electronically, will increase. Evidence for the emerging strategy is seen in the abdication of administrators who:

a) want expanded electronic access for their institutions,

b) don't want to find the funds for this exciting new development, and

c) don't even want to hear about it.

Any student of management knows that the statement "you figure out a way to absorb and reallocate" is an ultimate management abdication, because if there is one thing that our bosses are supposed to do it is to decide - decide on the basis of options we spell out and recommendations we make, and if the option involves the choice between an expanded service potential at a greater cost and a lower cost service even if it is obsolete and irrelevant, then this is precisely what their own job descriptions demand that they do. They must decide.

I have, in many of the writings that were so generously recognized last year, noted that we were far better at working hard, and even working effectively, than in getting credit or in understanding the political environment, and I won't bother you with those arguments in this paper today. However, there is plenty of evidence that the trend to trivialize both the cost of the library and the role of the professionals who presumably make its policies continues, with the greater emphasis on "the place" or "the thing", and that can grow into "the terminal" as all we need. In a branch of our profession somewhat different from that represented by this group, Eleanor Jo (Joey) Rodger of the Urban Libraries Council reports in the September 1, 1993 issue of Library Journal that there has been a drastic shift of public library funding from continuing education and training, but also from all other activities, in favor of a strategy of "just keep the doors open".[7] I think that Rodger reports accurately, but I disagree with her when she concludes that these changes implemented by management above the level of the library are therefore not the fault of librarians, in the failure to plan, to pint out alternatives, and to make others responsible for disastrous consequences that can result from their own bad decisions.

It is only a short step from "just keep the doors open" to "just keep the terminals wired for self-service" and never mind everything else, because we have a shortage of funds. If this is the result for academia, then all our strategies for enhancing access electronically, essential as this certainly is for the effectiveness of doing our jobs as we know that issue better than anyone else, will have become a Pyrrhic victory. Planning for resource sharing in the electronic environment must be large scale and of multi-year dimensions, and not micro-management, because this is an area that cannot be funded one year at a time. It is important that we develop these plans and projections, because if we don't somebody else will, and because they only know money or only know machines but don't know the information process their projections and conclusions will certainly be incompetent. As we develop our plans and documentation it should not be surprising if a number of strategies emerge that, quire coincidentally, also serve us. It should not surprise us because only candidates for sainthood do anything else. Everyone else, in a management setting, proposes what is best for them because they can certainly convince themselves that what is best for them is also best for the organization. Having convinced ourselves we then need to convince others.

Some, although by no means all, of the pieces of this strategy that we present to our administrators would include the following:

1) Electronic resource sharing and access are absolutely essential if this is to remain a significant institution for research, scholarship, and teaching.

2) Electronic access and resource sharing will be cost effective and even cost beneficial, but it will not be cheap. It will require additional money. Finding that money is the job of the administrators at the highest level, because finding money has always been their most jobs. Professors, and for that matter librarians, really need them for little else.

3) How much cost effectiveness and how much money depends in part on changes in academic behavior that we can only suggest but that we cannot enforce. Administrators then have a choice of either attempting some review of how the information use process takes place, or of finding even more money.

4) And of course, the planning and implementation of such a significant undertaking will require technical support from many people, particularly technologists and computer specialists. However, there is only one group of people that can effectively manage the effort. Guess who that is?

As I face the prospects of enhanced electronic access and resource sharing I am of course exhilarated by the potential opportunities. I am worried about the many vacuums that can be left in a piecemeal planning process. I recall enough from my study of physics to know that nature abhors a vacuum. If we leave vacuums somebody else will fill them. And that is my caution as we begin this conference.

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Resource Sharing through OCLC : A Comprehensive Approach

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Abstract

OCLC has provided a range of services designed for resource sharing over the past twenty years. How will these services be developed to meet the challenges of the new technologies? The paper reviews OCLC's strategic thinking and development strategy designed to assist libraries and their users to move into the information age.

Specific emphasis is placed on FirstSearch, OCLC's first online reference service developed for end users and its associated document ordering capability OCLC Dispatch. The paper reviews the way in which FirstSearch has been implemented in major US libraries and the evaluation of FirstSearch by 82 UK academic libraries in May/June 1993.

I began my career in librarianship working for Plymouth Public Libraries, a typical British Public Library. There was a then fairly new Central Library rebuilt after the war in the city centre and some twenty branch libraries in the suburbs together with a mobile library service. I worked in the central processing department where one of our main tasks was maintaining the union catalogue which identified the holdings of the central and various branch libraries: a standard card catalogue with a grid stamped on each card for indicating the locations of all the copies of each title we owned. I'm sure this scenario is familiar to many of you. We operated a paper system for requesting both known items and subject requests and a small fleet of vans transferred both the paper and the physical books around the city system. It was a time-consuming and I must say often boring process for those of us who had to file the cards and maintain the holdings. It did, however, provide a service and was "state of the art" at the time.

Last month my stepdaughter who is undertaking a distance learning nursing qualification asked me to help her identify some sources for her year's project which is on the care of the terminally ill in the community. I used the OCLC FirstSearch service to search a range of databases for both monographs and serial titles; identified locations and suppliers, and requested a range of items to help her with her project. Within a few days we had received books and photocopies of articles from both libraries and suppliers in the UK and the USA. She is still writing the project but I anticipate she will receive good marks for the research strategy!

I'm not going to elaborate on the period of time that has elapsed between these two scenarios but I am sure you can see that the issues remain the same for users to gain access to resources not immediately available to them. They need:

- bibliographic verification
- holdings locations
- delivery mechanisms.

Advances in technology merely enable us to address the issues more comprehensively and efficiently.

OCLC began to involve itself in resource sharing as soon as it began to build its cooperative database in the late 60s and early 70s. Library interlending using the database began as an offshoot to the primary activity of shared cataloguing. OCLC's Interlending System was introduced in 1979 and used the OCLC network to send electronic messages between libraries connected to the network for the purpose of making ILL requests. Since that time the use of the ILL system has grown each year and has outpaced the growth of the OCLC database itself. In that time the use of the OCLC system has extended from being a national US resource to an international resource. Nevins and Lang[1] analysed the growth of the use of the OCLC ILL system over a five year period ending in 1991. During that time - **figure 1** shows that - requests doubled from 2.7 million in 1986 to 5.4 million in 1991. The percentage of requests which were ultimately filled remained steady at around 86%. The reasons for the growth in the use of the system during this period could not be attributed solely to additional libraries using the system **(Figure 2)**, but more significantly to an increase of some 30% to the average number of requests per library which rose from 896 per library in 1986 to 1,165 in 1991 **(Figure 3)**. Finally, one further interesting fact to emerge from the Nevins and Lang study is that the provision of photocopies to fulfill ILL requests grew to represent some 44% of total loans in 1991.

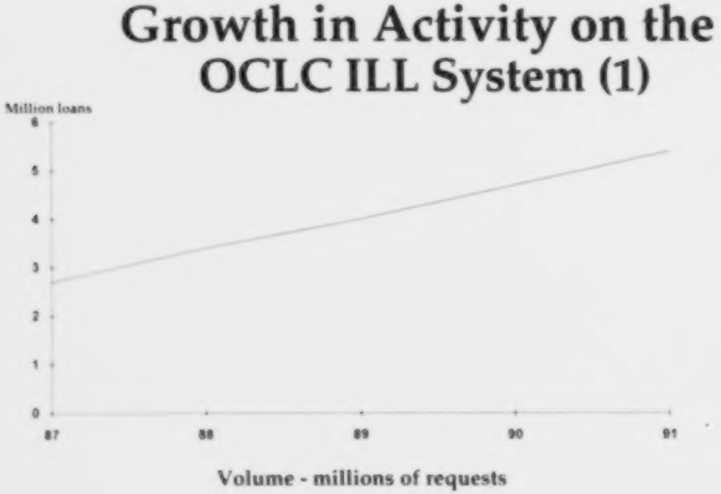
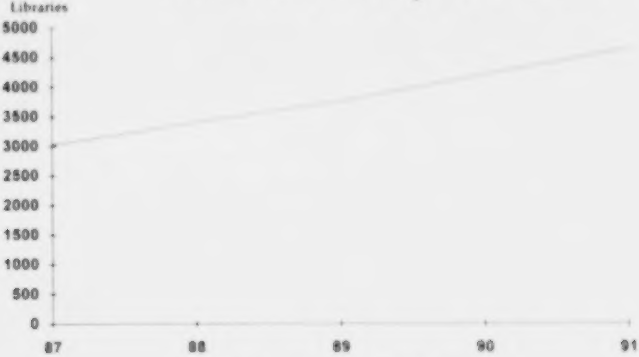


Figure 1

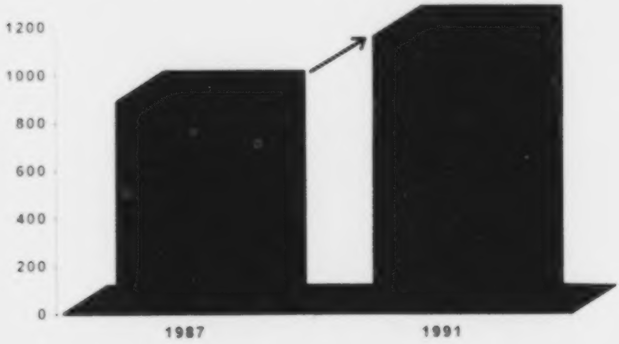
Growth in Activity on the OCLC ILL System (2)



Libraries requesting items

Figure 2

Growth in Activity on the OCLC ILL System (3)



Numbers of requests per library

Figure 3

If we assume that the provision of photocopies largely represents the lending of serial articles or conference papers then this becomes surprising since at that time the OCLC database firstly was primarily (85%) a database of monograph titles and secondly did not facilitate either subject searching or the ability to search at a level beyond that of a serial title. OCLC recognised that in order to help libraries to improve their efficiency in resource sharing activities it needed to provide bibliographic verification at the serial article or conference paper level; provide additional searching capabilities; and review new methods of document delivery. At the same time OCLC continued to pursue a strategy of enriching its database and improving the capabilities of its shared cataloguing service recognising the relationship of cataloguing and resource sharing as being complementary activities.

The development of a reference searching engine, called Newton, provided OCLC with a platform for becoming a database host. In the early 1990s OCLC introduced firstly an information retrieval service called EPIC designed for experienced online searchers and secondly an end user online reference service called FirstSearch. When they were first introduced they provided access to a limited number of databases but OCLC has increased this number so that at present both EPIC and FirstSearch provide access to more than thirty popular databases. These include the OCLC database itself (called WorldCat on FirstSearch), Medline, ERIC, BIOSIS, MLA and a range of Wilson and UMI databases.

The reference platform also enabled OCLC to develop additional databases of its own. The first of these is a Serials Table of Contents (STOC) database currently providing access to some 11,000 serial titles. This is shortly to be increased by the addition of unique titles from the British Library. OCLC estimates that this will add a further 4,500 titles to it's STOC file which supports the ArticleFirst and ContentsFirst databases available on both EPIC and FirstSearch.

OCLC has also contracted with the British Library to acquire records from the BL's Inside Conferences database which will contribute to two parallel databases ProceedingsFirst and PapersFirst to provide table of contents and conference paper indexes.

One of the unique features OCLC is able to provide to both its own and other publisher's databases is the linking of serial titles to holdings locations in the OCLC Online Union Catalogue. By linking an abstract or index entry in this way EPIC and FirstSearch are able to indicate whether the users own library owns the serial title (ie the article is likely to be immediately available) as well as which other OCLC libraries own the title (for a potential ILL request).

Whilst EPIC is similar to other information retrieval services operating on a charging mechanism relating to connect hour and offline and online prints FirstSearch has been described as "changing the entire online game" by Information Today and has won a number of awards including the 1992 Meckler Computer in Libraries Award for the most innovative Internet application.

FirstSearch is a menu-driven interface which is charged for on a per search or annual subscription basis. In Information Today, Mick O'Leary says "OCLC deserves polite applause for the technical design of FirstSearch, but a raucous standing ovation for this pricing method". It is primarily designed for use on networked campuses but is also attractive to special libraries and public libraries who wish to empower their users to undertake their own information searching. FirstSearch is very accessible both in terms of telecommunications being available via the OCLC network; academic networks such as JANET and WIN, and the Internet. It is also highly available in terms of hours of access being available via the Internet 23 hours per day Sunday through Friday. OCLC's ultimate goal is achieving around the clock around the globe availability.

OCLC has this year introduced two new features to FirstSearch which relate to document delivery mechanisms. Firstly the OCLC Dispatch service is available on a number of FirstSearch databases. Dispatch provides an online ordering capability to a number of document suppliers. At present the suppliers are UMI, Dynamic Information and ISI. Once an article has been identified using FirstSearch the order command initiates a screen which indicates which suppliers (and their prices) are available for the article in question. The provision of multiple suppliers provides competition which has already resulted in reduction of unit prices. Suppliers are currently providing delivery by fax, mail and courier and payment is either by deposit account or credit (Master or Visa) card.

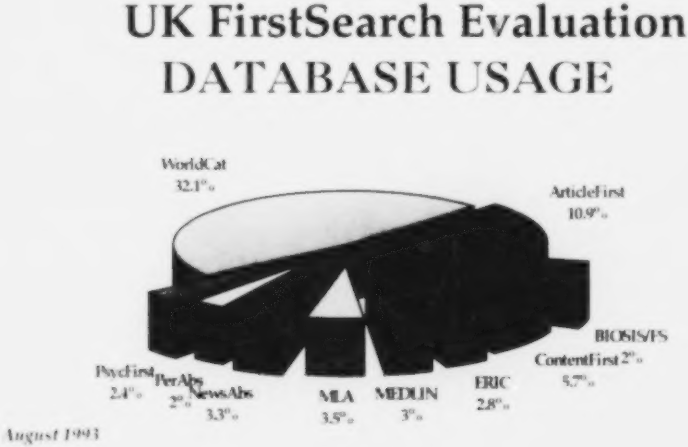
The second enhancement has been to provide a link from FirstSearch to the OCLC PRISM ILL system. Again, via the order command, the library's ILL department is identified as a potential supply mechanism. By completing the screen prompts end users can transmit an ILL request to the review file of the PRISM ILL system where it can be reviewed by ILL staff. FirstSearch can therefore facilitate both mediated and unmediated document ordering thus providing additional choice to the end user.

Since its introduction in late 1991 more than 800 institutions in the US have become FirstSearch subscribers. Their users like the simple interface and the range of databases which are available on FirstSearch. Librarians, initially sceptical about the lack of sophistication of the interface, are now won over because of the enthusiasm of their users. "FirstSearch improves the image of the library across our community" said one senior librarian to me on a recent study tour of FirstSearch installations in the US. "It enables me to provide instant access to over 30 databases by just signing an order form". At this particular institution FirstSearch was providing access to all the online databases required and had enabled the institution to cancel some CD-ROM subscriptions. In another institution FirstSearch was provided as a foundation source to general databases provided as an integral part of a reference service strategy which also included standalone CD-ROM databases in some departmental libraries serving particular subject areas and a site mounted tape service to what the library considered as their key subject database. Both the tape mounted service and FirstSearch were provided over the campus LAN with no indication to the end user of where the data was located. A similar approach has been adopted by Columbia University in New York where users first select the subject area of interest and the university's ClioPlus system provides a menu of potential databases. Only when the user selects a single database does the system access the appropriate host which includes FirstSearch and a number of alternative sources.

All of the libraries I visited acknowledged the continued increase in demand for interlending. They were divided on cause and effect. Most of them accepted that access to documents was the key issue and that the management of this process was becoming an important professional skill. The development of links, like the OCLC FirstSearch PRISM ILL link is seen to be an improvement in efficiency. "At least now we receive accurate and legible ILL requests which dramatically decrease the amount of time staff take in processing each request" said the head of one ILL department. By applying technology ILL workflows can avoid the rekeying of bibliographic data and speed up the process of sending and receiving materials.

Whilst FirstSearch provides access to a range of databases and this is always cited by librarians as one of its chief attractions usage of databases has, since its introduction, consistently been concentrated on the OCLC databases. The analysis for September 1993 indicates that 3.9% of searches were made on WorldCat, 13.6% on ArticleFirst and 3.2% on ContentsFirst. Medline was the most used non-OCLC database with 4.4% of total searches. The selection of databases to be mounted on FirstSearch remains an important process and OCLC has pursued a policy of maintaining a very broad subject coverage with emphasis on the humanities and social sciences. Recent additions have included the Columbia Concise Electronic Encyclopaedia and an interesting upcoming development will be the addition of "Current Information Sources" an international wire feed service which includes articles compiled by over one hundred sources such as Reuters, Knight-Ridder, Financial Times and stock exchanges.

FirstSearch has recently become available to European libraries. European availability was tied to the increase in hours of availability which was required in order to make it a viable service. Prior to the increased hours of availability installed at the end of August 1993 OCLC undertook an evaluation of FirstSearch in association with Chest (Combined Higher Education Software Team) in the United Kingdom in May and June of this year. FirstSearch was made available via the NISS gateway on the Joint Academic Network (JANET) free of charge to those institutions prepared to complete an evaluation questionnaire. The invitation to participate, allocation of authorisations, and subsequently the availability of the questionnaire and its return was all undertaken via the JANET network using a Listserve set up by Chest. 25 databases were made available to the institutions during the trial with the agreement of their publishers: 82 institutions participated in the trial and 36,244 searches were made on the trial databases. **Figure 4** indicates the databases which were most heavily accessed during the trial.



UK FirstSearch Evaluation
DATABASE USAGE

August 1993

Figure 4

OCLC Europe received 156 evaluation questionnaires representing 42 of the 82 institutions who participated in the evaluation from individuals. These respondents were largely (61%) library staff.

In terms of the responses 28 (28%) of the librarians described FirstSearch as "very easy" to use; 48 (48%) "easy" and 23 (23%) "not easy". For academic staff 23 (40%) found it "very easy"; 30 (52%) "easy" and 5 (8%) "not easy". It could be argued that the librarians who found it "not easy" were used to more sophisticated and complex retrieval systems and consequently found a "simpler" interface "not easy". This was borne out by US FS sites where we observed that library staff requested FS training sessions whilst end users simply turned it on and learnt from direct use.

In an attempt to obtain some comparative data, we asked respondents to rate FirstSearch "better than" or "worse than" some similar services with the following results.

Better than		Worse than
44	BIDS	39
10	Dialog	31
10	STN	17
12	Datastar	20

On this basis FirstSearch was described as marginally "better than" BIDS but "worse than" Dialog, STN and Datastar where comparisons could be made. It is difficult to draw conclusions on such subjective data, particularly when alternative systems are regularly used, and familiarity could be either a positive or negative influence, and on this basis we feel that the results are inconclusive.

A third approach was to invite respondents to identify possible enhancements or improvements to FirstSearch capabilities, and this question provided the most illuminative responses, since a number of enhancements were repeatedly requested.

Before discussing the requests themselves it is interesting to note the source of the requests. The 95 librarians generated 153 requests for enhancements whereas the 61 end users generated only 46 requests, thus reinforcing the view of the more sophisticated expectations and therefore more critical reactions of the library staff.

The major concern of the librarians was the lack of the "OR" operator (30 requests) followed by delete backspace (18); mark citations for printing (12) and improve author searching (11). For end users the main concern was US bias of databases (9) followed by delete backspace (6) and mark citations for printing (6) and improve downloading (5). The "OR" operator was ranked fifth with 4 requests from academic staff.

Since we had anticipated the US bias of databases as a potential issue we asked respondents to list databases they would like to see included on FirstSearch. We received 19 requests but no clear indication of preference.

Specific requests included ABI INFORM, MLA database, Inspec, Psych Abstracts together with a range of more general requests such as "more European", "British Nursing Journals" and "Any French Database".

OCLC has recently made available FirstSearch Version 2.3. This includes enhancements to the printing capabilities of FirstSearch identified during the UK trial. The availability of the "OR" operator is scheduled for inclusion in the next release of enhancements.

At the end of the trial 14 UK institutions elected to immediately subscribe to FirstSearch and these institutions are in the process of implementing FirstSearch within their institutions.

I have emphasised FirstSearch since it is innovative in the area of resource sharing in two respects. Firstly it is designed to enable end users to undertake their own online searching and secondly it provides them with a choice of delivery mechanisms. FirstSearch largely provides access to indexes/abstracts but is already moving towards the introduction of full text databases such as the Columbia Concise Electronic Encyclopaedia, Disclosure and Eventline. OCLC is also involved in electronic journal publishing with its Primary Journals Online series which now comprises three titles. OCLC has a fundamental commitment to resource sharing and a tradition and reputation for keeping abreast of new technological developments. It will continue to develop and make available comprehensive resource sharing strategies for both libraries and their users.

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The Business Information Network : Improving European Enterprise through Resource Sharing

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Sheila Corrall worked for five years in the public library sector and ten years at the British Library before joining Aston University in 1991 as Director of Library & Information Services. She has been actively involved in professional activities in the UK and has served on many national committees. Her current memberships include the Library Association Personnel Training and Education Group Committee, the Institute of Information Scientists External Affairs Committee, the SCONUL COPOL Advisory Committee on Information Systems, and the British Library Working Party on Electronic Publishing. She helped to set up the UK Business Information Network and is now Vice-Chairman.

Abstract

The UK Business Information Network was formed in 1990 as an independent self-financing co-operative of public, government and academic libraries committed to delivering quality products and services to their user communities. Promoted as a national resource for business people both within and outside the UK, the Network has subsequently been extended with the introduction of associate membership for commercial information suppliers. In 1992 it was awarded formal status as the Business Information Panel of the UK Library and Information Co-operation Council (LINC) with a remit to review, encourage and facilitate co-ordination of business information provision nationally across all sectors. Its current activities include production of a referral database/directory of expertise and resources; organisation of seminars and workshops; negotiation of terms and conditions

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with suppliers; development of quality of service guidelines; and circulation of a regular newsletter. A recent initiative is the creation of an electronic mail forum using the Joint Academic Network (JANET) for business information specialists in university libraries to exchange views on issues of mutual concern. The UK Business Information Network has also established links with organisations and institutions in other countries, and has served as the model for the formation of an equivalent network in Denmark.

Introduction

The UK Business Information Network (BIN) was formed in 1990 as an independent self-financing co-operative of public, government and academic libraries committed to delivering quality products and services to their user communities. The formation of BIN heralded a new era in national planning and resource sharing, characterised by determination to consolidate and formalise existing *ad hoc* arrangements, to build links between public and private sector providers and to encourage entrepreneurial service developments. The British Library played a key role in moving the project forward, but the impetus and direction came largely from the UK library and information services community. In its three years of operation, BIN has evolved in a dynamic and exciting way. The model has already been adopted in Denmark, and is capable of adaptation in other European countries and farther afield.

Background

The environmental factors providing the backdrop to this initiative are familiar to colleagues everywhere: public expenditure cuts; rising literature costs; growth in the supply of and demand for information, and the advent of new media and electronic publishing; promotion of the concept of 'tradeable' information, with the creation of a sizeable private sector information broking industry; the focus on customer care and quality, with emphasis on accountability and value for money. In the UK, seminal reports from government and other official bodies have shaped attitudes and behaviour in the library and information world, notably the ITAP report, *Making a business of information;*[1] the 'FD3' report, advocating planned co-operation through the development of local Library and Information Plans

(LIPs)[2] and the 'PUPLIS' report encouraging joint ventures between the public and private sectors.[3] In the world of business information, public and academic libraries have expanded and enhanced provision, with the introduction of fee-based 'value added' services, in tandem with the phenomenal growth in electronic information systems produced for the business user.

During the 1980s a mismatch between aspiration and achievement became apparent. A review of sixteen major projects sponsored by the British Library Research and Development Department between 1982 and 1986 pinpointed shortcomings in business information provision and barriers to progress: lack of awareness and understanding among the user community, particularly of the information resources held in public libraries; inadequate marketing of services; and shortage of staff with the necessary specialist knowledge and skills to exploit the new media successfully, exacerbated by the continuing pressure on library budgets.[4] The review concluded that some form of national co-ordination was needed - suggesting a network of regional centres - and a parallel study of the information needs of small firms pointed towards the concept of local access (via the public library) to the wealth of national resources available throughout the country.[5] A possible model was offered by the existing Patents Information Network, then jointly managed by the British Library Science Reference and Information Service (SRIS) and the UK Patent Office,[6] but the national library was not in a position to fund an initiative on the scale envisaged. Instead, responding positively to overtures from several public library authorities, SRIS took the lead in setting up a working group to develop and refine ideas put forward by the community, and BIN was conceived as a national initiative embracing many of the features associated with LIPs, but firmly based on the principle of a self-managed co-operative funded by members' subscriptions.[7]

Strategic Focus

The ultimate purpose and national role of the Network is encapsulated in the mission statement adopted by the working group, and subsequently endorsed by the Management Committee elected by the founding members at their inaugural general meeting -

> "To improve the performance and competitiveness of British enterprise through the better use of business information".

From the beginning, a commitment to continuous improvement and a significant European dimension were envisaged, reflected in the set of objectives agreed at that time:

- to promote exploitation of business information resources throughout the UK;
- to improve the overall standard of business information provision;
- to provide an effective focus for the development of business information products and services;
- to develop partnerships with information providers in other parts of Europe.

Specific goals were also identified to guide the Network's programmes and activities through its formative years:

- to raise awareness among the business community of the value of business information;
- to establish the Business Information Network as the national public resource for business people, within and outside the UK;
- to strengthen the links between public-sector business information providers, both in the UK and in Europe;
- to devise cost-effective methods of achieving wider access to business information;
- to identify gaps in business information coverage and initiate projects to fill them - for example, information on Small and Medium-sized Enterprises;
- to develop strategies to meet particular nationwide information needs - for example, the Single European Market;
- to exploit the opportunities provided by new technology in the context of business information.

Membership

BIN membership was initially restricted to publicly-funded libraries and information units which had the equivalent of at least one full-time member of staff committed to business information - 'publicly-funded' being defined here as an organisation receiving more than half its funding from central or local government sources - and there was a flat-rate annual subscription of £375, irrespective of the number of sites or service points involved. The working group acknowledged the significant role of the private sector in business information provision, but wanted a simple structure at the start; they were also concerned that commercial firms might find it difficult to give due priority to co-operating with other BIN members, and that the competitive nature of their activities might be at odds with the public service ethos. However, during the set-up period there was a steady stream of enquiries from accountancy and law firms, brokers and consultants, Chambers of Commerce, industrial libraries, professional and trade associations, publishers and database producers. Requests from the latter to join the Network in a supportive role subsequently persuaded the Committee to admit them as Associates, paying the same rate of subscription but without voting rights or entitlement to other membership privileges (such as reciprocal discounts on services). Three years on, the Committee decided to review the criteria for membership in the light of changing circumstances, and a radical restructuring was approved at the 1993 annual general meeting.

The new structure reflects the wider range of activities and the enhanced strategic role which BIN is equipped to take on now that it is firmly established in the business information world. The key features are a shift from an organisation-based to a site-based subscription for full members (perceived as a fairer method of distributing the financial burden between organisations of increasingly varied size and complexity) and the introduction of a new category of Affiliate members. The changes are also designed to stimulate more active participation by academic institutions, recognising the important contribution of this sector in educating and training the business community of the future. The current membership categories are as follows:

> *Full membership* is open to any library or information service which is part of a not-for-profit organisation (eg public libraries, academic libraries). Membership is site specific, and any eligible organisation may nominate any number of its sites or service points for membership, provided that in every case the site concerned has the equivalent of at least one full-time person involved in the provision of business information. Subscription: £95 per site.
>
> *Affiliate membership* is open to (a) organisations providing other intermediary business services, ie libraries and information services

which are in the private sector, either free-standing profit-making services or part of profit-making organisations (eg brokers and consultants, banks, Chambers of Commerce, accountancy and law firms, professional bodies and trade associations, industrial libraries) and (b) educational organisations providing business studies or business-related courses in the public or private sectors (eg departments of information studies/library schools). Membership is site specific, as above. Subscription: £95 for organisations with up to ten employees, or £195 for more than ten employees.

Associate membership is open to for-profit organisations which are sympathetic to BIN's aims (eg publishers, commercial suppliers, database producers and hosts involved in the supply of business information). Associate members do not have voting rights, nor are they eligible for discounted rates on services negotiated by the Network on behalf of Full and Affiliate members. Subscription: £395.

Activities

In the first year of operation, priority had to be given to securing the infrastructure of the Network, and especially to the recruitment of a sufficient number of members to justify the appointment of a professional manager and administrative support. The British Library continued to act as a facilitator, providing both professional and administrative support for the initial recruitment drive, which attracted more than fifty members during the first twelve months. Some two-thirds of the initial membership came from the public library sector (representing all parts of the UK) with the balance made up of academic, government and national libraries. This enabled the BIN Management Committee to recruit an experienced free-lance business information specialist to act as Network Manager (on a part-time basis) and later to retain a second free-lance consultant to support the public relations/media activities required to establish the Network's profile. The British Library was then able to reduce its support to a more appropriate level, but with continuing input as an active member, as well as providing office accommodation for the Manager.

Key tasks identified were intended to support and stimulate the exchange of information and sharing of expertise among members, and thus included the circulation of a regular newsletter, creation of a referral database/directory, and the discussion of training and development needs. The referral database was deliberately designed as a tool to help offset the lack of comprehensive collections and specialist staff at the local level by enabling members to identify colleagues with expertise in particular areas and to act as human gateways to more specialised services throughout the country. The database contains information on members' resources and services at a more detailed level than other library directories, covering access to online hosts; areas of strength, such as countries regularly researched and language skills; links with other libraries/information providers; significant holdings of statistics, standards, patents, official journals, newspapers, market research reports, company annual reports, CD-ROMs, etc and special services (eg translation) together with charges/conditions of use. Contact names and addresses are given for both central and branch libraries, and a geographical listing and map enables users to locate members by country and then by county. The newsletter (now bimonthly) allows changes in contact details to be notified quickly, pending the issue of the next quarterly update to the directory - which is provided free to members, and is available to others for a fee, with the option of an annual subscription for the updates.

The potential benefits of pooling resources to mount joint publicity and promotion campaigns were seen as central to the Network's *raison d'etre*. The need to raise awareness among the business community of the availability of business information products and services - and indeed of the value of information to support business decisions - was shared by all public sector business information services, and it made sense to collaborate in efforts to get a common message across. A logo and house style were developed, and incorporated into a leaflet explaining (with examples) what members offered, with a space for local contact details to be added. The house style has been carried through to letterheads, posters, presentation folders, etc, acknowledging the importance of conveying a businesslike image. BIN has also been promoted through articles in the professional and trade press, presentations - by the Network Manager and individual members - and press releases (which have been rewarded with several favourable mentions in the *Financial Times*). At the same time, work began to develop draft quality guidelines for service to members and users, intended to encourage good practice and provide a framework within which members set their own standards and targets, in accordance with their institutions' mission and objectives.

As BIN's membership and status have grown, it has been able to put pressure on suppliers to members' benefit and to influence policy discussion at national level. The Network Manager has negotiated discounts and special deals with publishers on behalf of members (which are publicised in the newsletter). BIN has also challenged database producers/hosts over attempts to impose contractual obligations regarded as unfair and unethical, and has thus succeeded in protecting both intermediaries and end-users from unscrupulous behaviour threatening to undermine the confidentiality of the professional-client relationship. Earlier this year, it was invited to give evidence to the Monopolies and Mergers Commission investigation of the supply of historical online databases for archival business and financial information (with particular reference to the position of FT Profile). In 1992, BIN became the official Business Information Panel of the Library and Information Co-operation Council (LINC) and thus acquired a formal role as expert adviser on library and information co-operation in relation to business information across all sectors throughout the British Isles. LINC was established in 1989, with the objective "to promote co-operation and partnership as a means of improving the effectiveness of the library and information sector in the UK and the Republic of Ireland".[9]

BIN's remit in this role reflects the general aims of LINC, but with a specific responsibility for business information, and thus includes reviewing, encouraging and facilitating all types of business-related library/information co-operation; acting as a forum for the exchange of views on such co-operation; and collecting and disseminating information thereon. Its first major initiative in this capacity will be the conduct of a survey of the range and breadth of co-operative developments in business information in the UK, which is being funded jointly by LINC and the British Library Research and Development Department. This research has been prompted by BIN's concern at the burgeoning of co-operative developments in the field, which frequently overlap in terms of market, customer base and services, while the communication and pragmatic links between them are at best accidental and unplanned. This is not, however, BIN's first research venture, as in 1992 it commissioned a study (conducted by the City University Department of Information Science) on the effects of the economic recession on business information services, which concluded that despite difficulties in marketing fee-based services, demand for business information had remained buoyant and there was scope for expansion.[10] In keeping with its desire to facilitate the sharing of information among the business information community, BIN has with this study initiated a publishing programme to ensure that the results of its efforts reach the widest possible audience.

In addition to the above research, BIN has also recently published the proceedings of its second successful seminar held at the annual International Library Technology Fair in Hatfield, Hertfordshire, offering members and others the chance to purchase either individual papers or the complete set.[11] The previous event, on the theme of "Current issues in business information technology", underlines BIN's concern to help members exploit new technologies to improve standards of service provision. Innovation through information technology characterises another exciting project which involves BIN as a major player in a partnership with library communities in Belgium and Portugal formed to develop a pilot enquiry and referral service, based on the X.500 directory standard, with funding from the European Commission under Action Line 2 of its Libraries Programme. The Library and Information Referral Networks (LIRN) project is being co-ordinated by LASER - the London and South Eastern Library Region - and BIN members will participate in the definition, implementation and evaluation phases. LIRN aims to provide a rapid response to enquiries and makes information available to libraries on a European-wide basis, by developing a thesaurus and distributed database of information sources, using business as the subject focus for the study.[12]

Within the UK, BIN is launching a timely new service directed initially at the university library community, but extending beyond BIN members to involve everyone interested in business information provision and use in an electronic forum to identify and address issues of current concern. LIS-BIN will operate as an unmoderated e-mail discussion list, open to business specialists in the higher education community who have access to JANET (the UK Joint Academic Network). This initiative is an example of BIN's determination to assume a wider role in national co-ordination as part of its responsibilities as the Business Information Panel of LINC. Although BIN's public and government library members are not at present connected to JANET, the initiative is well timed as it will run in parallel with a project investigating the potential benefits of networking for public libraries, with the expectation that within the foreseeable future all BIN members will be able to communicate with each other electronically. (In the meantime, members can use BIN's electronic bulletin board hosted by DataStar.)

European Role

Development of a European dimension to BIN was envisaged from the outset as a natural progression. The BIN directory enables members to identify colleagues likely to be able to assist with requests for European company, market and product information; entries cover countries regularly researched, foreign language skills, significant holdings of overseas directories, etc. as well as giving details of specific links with information providers in other parts of Europe. The Network has already generated considerable interest in other countries and informal links have been established with corresponding members in Spain, France, Finland and the Czech Republic. In November 1992, the BIN Management Committee was delighted to learn of the successful launch of the Erhvervs Informations Netvaerket (Danish Network for Business Information) and the publication of its directory, deliberately taking BIN as its model. BIN members are also looking forward to working with Portuguese and Belgian colleagues in the forthcoming LIRN project; development of effective electronic links across national boundaries may raise the question of admitting colleagues from other countries into full or affiliate membership.

A Global BIN?

BIN has established itself as an impressive model for resource sharing within the UK. In three years the Network has made steady progress towards its objectives and goals, it has undergone substantial restructuring and development, and is now acknowledged as a major player in the national arena and in Europe. Key features include the emphasis on staff expertise as the shared asset of the Network, the successful establishment of a corporate identity, and evolution into an effective lobbying force in the commercial world. New technologies already underpin the delivery of members' services to their customers, but are beginning to have more impact on roles an relationships and the Network's future direction. The prospect of a global BIN by the end of the decade is both feasible and desirable.

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Cooperative Acquisition and New Technologies for Resource Management and Resource Sharing : An American Model

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Abstract

The libraries of the four doctoral granting centers of the State University of New York system have embarked on an ambitious initiative in cooperation and planned collection interdependence. This is possible through the development of appropriate technology, policy negotiations among the four campus library directors, administrators, and faculty, and a commitment by collection development and public services librarians to the concept of making shared collections serve the users of the four campuses.

Using client/server software and the Z39.50 protocol to link the four campus catalogs and a catalog-based request service, students and faculty on all four campuses will be empowered to interact with collections and staff of other libraries and served as if they

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were at their own campus. Collection development officers have used the results of collection overlap and journal use studies to plan a "metacollection" to serve users from the four campuses.

Introduction

The State University of New York enrolls 298,000 students in a decentralized system of four doctoral granting university centers, thirteen liberal arts colleges, eight specialized colleges, four medical schools and six colleges of technology and agriculture. Each institution has a distinct mission and is governed by its own council, president, and faculty senate (**Figure 1**).

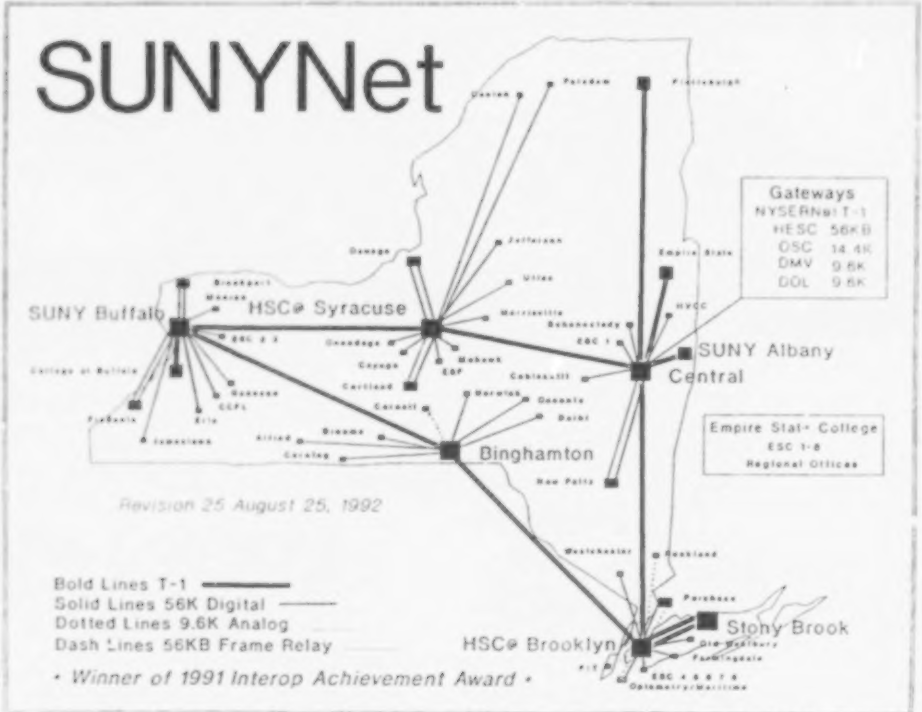
The information presented in this paper is an overview of cooperative activities among libraries of the four doctoral granting institutions of the State University of New York system -- the University Centers at Albany, Binghamton, Buffalo and Stony Brook. The four university centers have distinct curricular interests and research missions and the libraries reflect these differences in their collections. They are all members of the Research Libraries Group (RLG) and three of the four are also members of the Association of Research Libraries (ARL).

The 300-500 miles between campuses make it impossible to work face-to-face on most of the cooperative activities. Electronic mail and telefacsimile technologies have been and continue to be the main means of communication among the libraries staff on the four campuses. Other technologies will be discussed below.

New Technologies for Cooperative Activities

The libraries are using the Internet, telefacsimile transmission, Ariel software, NOTIS PacLink/PacLoan client/server software, Geac Advance client/server software and the Z39.50 standard for resource sharing.

Client/server software and the Z39.50 protocol link the catalogs of the campuses in such a way that the user has seamless access to remote catalogs and can interact with them as he/she does at the home campus. Three of the campuses use NOTIS software running on the IBM VM/MVS operating system. The third, Albany, is in the process of installing Geac Advance, a UNIX-based system. This mixed environment presents technological as well as policy and procedural challenges in linking the four libraries.


SUNYNet
Canton
Potsdam
Plattsburgh
Gateways
NYSERNet T-1
HESC 56KB
OSC 14.4K
DMV 9.6K
DOL 9.6K
Oswego
Jefferson
Utica
Empire State
Brockport
Monroe
SUNY Buffalo
HSC@ Syracuse
Morrisville
HVCC
Schenectady
ESC 2 3
Onondaga
ESC 1
SUNY Albany
Central
Cayuga
Mohawk
EOP
Cobleskill
College at Buffalo
Cortland
Genesee
Morrisville
Oneonta
CCFL
Cornell
Delhi
Fredonia
Erie
Empire State College
ESC 1-8
Regional Offices
Broome
Alfred
Jamestown
Corning
Binghamton
New Paltz
Revision 25 August 25, 1992
Westchester
Rockland
Bold Lines T-1
Solid Lines 56K Digital
Dotted Lines 9.6K Analog
Dash Lines 56KB Frame Relay
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Stony Brook
HSC@ Brooklyn
Old Westbury
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Optometry/Maritime
• Winner of 1991 Interop Achievement Award •

Figure 1

Z39.50 is an American National Standards Institute (ANSI) standard for communication between client and server software for bibliographic information. Its full title is *Information Retrieval Service Definition and Protocol Specifications for Library Applications*.

Client/server software architecture divides functions into requester (client) and provider (server) subsystems that use a standardized method of intercommunication. The client software formulates and issues a request for information or services and usually provides the interface to the user. The server software receives and fulfills requests, from one or more clients, for information or services. The user generally does not have any direct interface with the server software.[1]

Late in 1990 the SUNY University Centers joined eight university libraries in the state of Indiana to identify requirements and design specifications for linked catalogs and user-interactive systems. Because NOTIS is already installed in three SUNY University Centers, and because NOTIS is a leader in development of the ANSI Z39.50-compliant system, the NOTIS model is described in some detail. The Geac system is expected to provide comparable functionality so that the University at Albany may participate as an equal partner in the four-campus shared resources program by 1995. NOTIS PacSearch and PacLoan are among the first of many systems expected to come to market as vendors cope with the instructional and service needs and implications of open systems. It is not our purpose to describe or assess competing products here, but to indicate that it is a contractual requirement of Geac to develop software to provide the University at Albany campus with functionality comparable to the NOTIS functionality at the other three University Center campuses.

The NOTIS product that resulted from the discussions and contractual arrangements is called PacLink. "PacLink is a client/server application which permits end users at one site to seamlessly connect to online catalogs at other sites. With a few keystrokes, the end user can extend a search to the catalog of another institution."[2]

PacLink software provides the end user connection to another online catalog from a menu of catalogs preselected by the institution. It requires no sign-ons or other indications that a remote linkage is taking place. The user does not have to end the local system session in order to use the menu of options to connect to the other libraries. PacLink allows users to reuse a search strategy in the remote catalog, without rekeying it. Once connected to another catalog, the user can search that catalog using local system commands. In the case of the University Centers using NOTIS, this is already possible through Telnet sessions; however, for Geac Advance users searching NOTIS systems and vice versa, this will be of great benefit. Once the Geac Advance Z39.50 capability is implemented at Albany, the intersystem searching benefits will be the same for users at all four institutions.

PacLink is designed to be an end user system which provides searching of remote catalogs on the Internet without the need to use the remote system commands and interfaces. When a citation is found in a remote catalog, the user can then request retrieval and circulation from the remote library. It is designed as a resource sharing system based in the local online catalog.

How the Technology is Used

In Stage One of the program, which will begin in January 1994, members of all four University Center campus communities will be able to access all four library online catalogs. Users at Binghamton, Buffalo, and Stony Brook will do so through the NOTIS search software, while Albany users connect through communications software such as Kermit and Telnet.

Users continue to submit paper interlibrary loan requests in the usual way to the appropriate library offices which will initiate the borrowing transactions from the other campuses. An agreement called "SUNY Express" calls for expedited (48 hour turnaround time) service on transactions from the partners. The lending campuses, including Albany, respond to interlibrary loan requests by transmitting articles and chapters of books via Ariel document delivery software or parcel post delivery.

A user-initiated request service will be available in Stage Two – the PacLoan stage, which will be operational in early 1994. NOTIS PacLoan allows users to initiate requests for materials that were found in a search session, based on institutional agreements and other parameters such as standard of validation that the user requesting the material is a member in good standing of the university community. The Geac equivalent of PacLoan is expected to be delivered to Albany by January 1995.

When a user requests materials found in a search of a remote catalog, he/she uses a request screen into which the bibliographic information is automatically posted, saving time and guaranteeing the accuracy of the request. The request allows for special instructions. The request process is interactive with the local system. It checks the user's home database and notifies the user if the material is also owned by the home library; it also requires local system validation of current eligibility to borrow. The user must enter a personal password which is validated against the home institution file. The request is queued by the system for review by the appropriate library office (eg. Interlibrary Loan, or Circulation).

Management controls have been designed to assist the local institution:

- a system verified user name/id number/status appears on the requests;
- queuing of the users' completed requests in an approval file for local review before transfer to the remote site;
- item status reports as the request is acted upon at the remote institution;
- local circulation system parameters for managing the borrowed material such as overdue and recall notices or fines, if they are levied.

Borrower confidentiality is enhanced as the transactions are stored in machine-readable system codes rather than in paper card files.

The staff of the remote site reviews the requests before acting on them and communicates with the other institution as appropriate. The materials are charged to the remote user, not to the interlibrary loan office, using lending parameters that may differ from lending of locally-owned material. These parameters will follow interinstitutional agreements rather than the national interlibrary loan code.

New Technology Management Issues

The University Center Libraries' goal is to provide most campus community members with user-initiated access and delivery of shared library materials. This goal, supported by the ANSI standard and specific technological enhancements like PacLink, presents a challenge in organizing the staff of the participating libraries. The concepts of user empowerment and self-sufficiency will change dramatically the way the libraries operate. Staff at the four libraries must be prepared to accept changes in relations with users, new relations among departments within the library, and closer working relationships with people hundreds of miles away.

Most of the work among the University Center Libraries up to now has been accomplished in the background while each library conducted local business as usual. The next phase, realizing the shared collections concept, requires dependence on installation of new technologies, their ongoing development, and creation of a daily interactive program that becomes part of the core operations of each institution.

Underlying use of PacLink are some basic requirements for cooperation:

- The University Center libraries (and any other libraries they subsequently access in this way) must share the philosophical concept of shared resources and collection interdependence.
- Library administrations and university academic administrations and faculty must be cognizant and supportive of the goals and problems of collection interdependence.
- Areas of previous fierce institutional independence and a source of potential institutional problems such as loan period, recalls, overdue enforcement, and fines must be subject to joint agreements that may supersede some local practices.
- Libraries must change their workflow procedures to support a priority service to the selected partners.
- All participating libraries are required to install server software that uses ANSI standards for Common Command Language and Information Retrieval Protocols and that all have high-speed connections to the regional network using TCP/IP Internet protocols.
- All participating libraries must have client software that provides the local user interface to the corresponding server software.

A powerful capability is transferred to the user. It empowers the user at his/her desk at home, in the office, or on the road, to search, identify and order materials without going to the library, roaming the stacks, and queuing at various service points. On the less positive side, it has the potential to bypass the professional interaction and assistance that local circulation or interlibrary loan or reference staff may give in identifying alternative local sources to meet a user's need. It has the capability of transferring to -- and increasing the workload of -- the other institutions which will now receive the direct requests from remote users.

New technology has made it possible to change the libraries' service philosophy. "Their users are now our users." This change will require organizational and psychological changes. The technology specialists have given library collection managers and administrators something close to their "ideal" environment for resource sharing. Now it is up to them to put that technology to use.

That is in effect Stage Three of the program for cooperation, which is supported by NOTIS PacLink and Geac Advance technology. This technology allows the libraries to share locally mounted databases such as machine-readable tapes of abstracts and indexes. The three NOTIS sites plan to share files such as *Newspaper Abstracts* and *Psychological Abstracts* over the Internet, beginning in January 1994. And there are other plans for planned collection interdependence.

Resource Management

The four libraries' first cooperative projects concerned the *technology* for resource sharing. In 1989, with funding from a US HEA Title IID grant, the libraries successfully tested the feasibility of telefacsimile delivery of journal articles. Next they worked on the development and NOTIS PacLink.

These initiatives led the four libraries to study the *policy* side of cooperation and in 1991 they received a cooperative planning grant from the Council on Library Resources to accomplish five broad goals:

1. to carry out the necessary general policy analysis and associated research activities which will undergird policy formation and implementation planning;
2. to produce data on the use of serials and to produce data on loan procedures;
3. to define the specific operating policies under which cooperation can function among the SUNY University Center Libraries;
4. to create a formal and ongoing planning process for a technological interlibrary infrastructure that will facilitate cooperation;
5. to document the undertaking and to describe the politics of cooperation so that this effort can serve as a model for other similar institutions.

Studies of interlibrary loan transactions funded by the CLR grant showed that the collections on the four campuses held about half (49%) of the titles requested by clients on interlibrary loan and that requests were supplied with a success/fill rate of 82%. These results were encouraging enough to prompt the four libraries to move forward with their plans for interdependence.

Journals

Concrete data on the use of journals on the four campuses was essential to inform planning for cooperative collection decisions. Journals, particularly those in the sciences, account for the largest part of the four libraries' materials budgets and are most subject to extraordinary price increases. Also, it was thought journal articles provided the most obvious material for sharing, due to the likely overlap of titles among the collections and the comparative ease of document delivery.

The first stage in the CLR journal use study was to produce a "snapshot" tape of the periodical titles held by the four University Center libraries. Reports from this tape, which was produced by OCLC, showed promise for cooperation because a little more than half (52%) of the currently received titles on it seemed to be held by only one of the four libraries **(Figure 2** and **Figure 3)**. Also, this uniqueness was fairly well distributed among the participants.

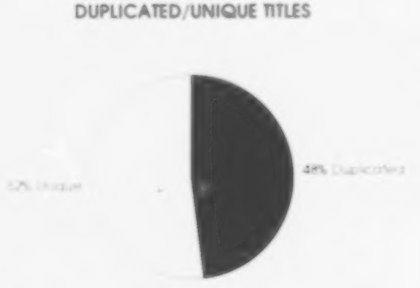

Figure 2

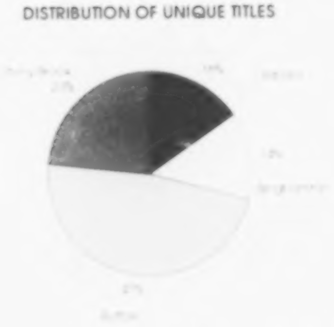

Figure 3

The journal use study showed which of the duplicated titles were little-used and might be sharable. The study showed which duplicated titles were heavily-used on one campus and little-used on the others. The study also showed which of the unique titles were heavily-used and therefore were likely to be kept. Finally, the study identified which unique titles could be cancelled because of low use, or no use.

Results/Actions Taken

The most significant result in the study may be that, depending on the campus, one-third to one-half of the titles studied had five or fewer uses.[1] Thirty-six percent of the titles, mostly the uniquely held ones, were used five or fewer times, and therefore might be candidates for cancellation and sharing **(Figure 4)**.

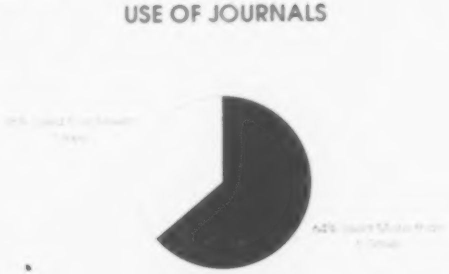

Figure 4

The study was designed to be a "one-shot" project aiming to get collection policies and resource sharing procedures in place for the advent of NOTIS PacLink and PacLoan. The data files for each campus were returned to each participating library. Follow-up studies or other use of the data are local options to be done by each campus independently. Despite the drawbacks of conducting such labor-intensive projects, some participants feel journal use studies should be repeated at regular intervals to gain credibility with users, to validate the data, and to mark trends.

The libraries have used this information for serials cancellation and retention decisions. Three of the four are completing large serials cancellation projects this year, the need for which arose independently of the results of CLR project. These libraries used the CLR data to identify "high cost/low importance" titles in their cancellation projects **(Figure 5)**. The fourth library used the study results to calculate the cost per use of certain journals to determine if it were cheaper to deliver these titles by interlibrary loan or by commercial document delivery services than to own them.

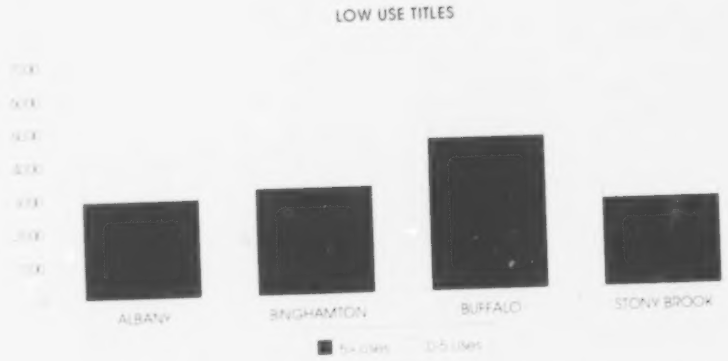

Figure 5

Plans for Cooperation

Working together on the project brought the heads of collection development of four participating libraries closer together. We learned about each other's organizations, periodical collections and shelving practices. We also learned the importance to cooperative ventures of teamwork and planning.

The results of the journal use study raised several important questions for the participants. One question was "What should be done with the money 'saved,' if there were any?" It could be used to add staff to interlibrary loan, to subsidize commercial document deliver, to subscribe to new unique paper journals, to purchase expensive microform sets, to acquire new information resources such as magnetic tapes from abstracting and indexing services or subscriptions to OCLC FirstSearch. Another question was "Should the low use journals be cancelled from the University Center Libraries 'on principle'?" Most of the low-use titles were held by only one library in the group. "Should there be any concern about 'last copies' in the partnership?" "What criteria should there be for retention of titles held by more than one partner?" and "How will the University Center libraries add new subscriptions in the future?"

The pieces are falling into place for cooperation. Key collection development and public service staff in the participating libraries met in March 1993 and drafted a document called the "SUNY University Centers Cooperative Journals Program" and the circulation and interlibrary loan managers developed a Shared Collections Policy. These policies were presented in April to the SUNY-wide high-level Policy Advisory Committee convened as part of the CLR grant and subsequently endorsed as policy for the four libraries.

The Cooperative Journals Program calls for

- communication and cooperation regarding journals cancellations plans as well as the acquisition of new journals subscriptions;
- a procedure for notification, review, and appeal of journals cancellations and acquisition plans;
- agreements and procedures to provide rapid document delivery of articles, tables of contents, etc. from journals among the University centers, using Ariel, telefacsimile, and other appropriate technologies.

Specifically, the document envisions a yearly exchange of information and decision-making regarding journals.

March	Campus lists created of journal titles under consideration for cancellation.
April	Lists shared among local faculty and University Centers; comments and objections to cancellations communicated.
May-June	Cooperative agreements developed among the Centers. Final cancellation lists prepared on each campus.
August	Implementation of cancellations and sharing agreements. Inputting of lists into Centers database.
October	Lists of proposed new subscriptions to be placed for the next subscription year shared among Center libraries to avoid unnecessary duplication.

In collaborating on serials collection decisions the libraries involved will consider:

- Level of use of titles
- Cost per use of titles
- Holdings of titles among participating libraries
- Demand for new titles
- Availability of titles in other libraries or consortia
- Availability of titles from commercial document delivery services at reasonable cost
- Program needs and program changes on individual campuses
- Budgetary conditions at individual campuses and throughout the SUNY system.

The libraries involved are moving from independently designed and managed cancellation projects on the four campuses to annual collaborations that theoretically begin with the individual selection officers.

Conclusion

Cooperation among libraries is not new. What is new is the kind of cooperation -- electronic-assisted -- and its growing importance. Cooperation is no longer simply operating on the fringes of collections.

Roadblocks to cooperation are not technical, they are largely human-resources-related. As Paul Mosher noted in a talk he delivered at the 1989 IFLA conference at Brighton:

"The essence of management in collection development is not budgetary or organizational but cultural, though these other two elements are also present and significant. Collaboration in collection development is reached by agreement on common values and goals rather than by a process of working out personal differences or organizational mandates. Factors crucial to effective collaboration include:

effective mutual communication

helpful and facilitative attitudes

mutual sensitivity to needs, motives and concerns

a cooperative and supportive role by administrators."[1]

To quote from the introduction to the CRL grant proposal:

> "We firmly believe that SUNY Centers can *define new national standards for cooperation and service*. By focussing on real needs rather than on building redundant collections, the SUNY Centers will become more responsive, more financially responsible, more manageable."

What have We Learned?

It is clear that new technology has been the catalyst for significant resource sharing. If the SUNY University Centers have a model to share with other libraries it is the following:

1. Create a union list of serials
2. Assure the availability of reliable, user-initiated document delivery
3. Link catalogs and share other bibliographic database electronically
4. Change the shape of the collection, assisted by collection and use studies

The Future

Important technological problems remain to be confronted.

Libraries can now deliver overwhelming amounts of bibliographic information to their clients in electronic form. They now face the issue of how to deal with problems created by what seems to be an overabundance of bibliographic information. Binghamton University now offers its clients the information in the ERIC database in five different ways: paper, CD-ROM, FirstSearch, and through Internet from the computers at Syracuse and Auburn universities. Libraries must move from provision of redundant indexing to the delivery of information itself. There must be a melding of the capacities of products like CARL Uncover II and OCLC ArticleFirst -- up-to-the-minute indexing, table of contents simulation, online document delivery -- with the more sophisticated search, retrieval and formatting of DIALOG, BRS, ISI, and SilverPlatter. The standard for interlibrary loan similar to the Z39.50 standard for bibliographic information must be implemented. Significant amounts of full-text online information over the Internet must be made available and control gained over the chaos now characterizing the Internet. The names given to files of information do not now convey meaning to users. What does "Melvyl" mean? What kind of information is contained in "Eureka?" or a "Marvel?" It is small wonder most clients prefer to search in something called "WorldCat."

There is a big difference between what it takes to work on grant-funded, project-based activities and the kind of energy and commitment needed to sustain ongoing cooperation among complex and disparate institutions like the four University Centers. The SUNY University Center libraries are committed to finding that energy and commitment to take their next steps together.

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Information Networking Issues and Initiatives : The North Texas Experience

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Abstract

Access, rather than ownership, is the resource sharing paradigm of the decade. The deliberations of the 26 North Texas libraries which comprise the Alliance for Higher Education consortium will form the basis for reviewing pivotal aspects of regional resource sharing issues and initiatives, including:

- **the re-consideration of traditional ideas of self-sufficient libraries owning all materials required by their primary users;**
- **the re-orientation necessary for cooperative collection development activities among librarians, including a shared vision;**
- **the administrative infrastructure necessary to ensure the coordinated advancement of both technological "have" and "have not" libraries; and**
- **the professional priorities most necessary to transformation of regional library environments.**

For a year, through planning activities begun in November 1992, these issues and initiatives have been debated by the directors of the 26 member institutions who represent regional academic libraries with varying needs for information access and document delivery. Occurring at a time of fixed or declining library budgets, these discussions have probed how best to upgrade the "information competence" of the region, including increasing diversity in local collections and improving gateway access to remote resources. The status of the deliberations as of September 1993 will be reviewed, in the larger context of developments in information and telecommunications technology.

Access, rather than ownership, is the resource sharing paradigm of the decade. In pursuit of new approaches to resource sharing, members of the Alliance for Higher Education have vigorously debated how best to implement the resource sharing concepts. The belief system that has sustained these consortial discussions among academic librarians in North Texas originate from the not-for-profit and free-access-to-information tradition of individual libraries."[1] Highlights of the issues and initiatives characterizing their contemporary discussions will comprise the text of this paper.

Consortial Library History

This is a fitting occasion to reflect on the Alliance's library program, which has just completed 30 years of continuous cooperative relationships and services. From its earliest beginnings, North Texas librarians have recognized the mutual benefits of interinstitutional resource sharing.

- They have formulated policies and procedures promoting interlibrary loan (ILL) both through users' onsite consultation of resources and through librarian-facilitated document delivery.
- To expedite the latter, they have charged the Alliance with the responsibility of coordinating a regional courtesy card program which extends onsite usage privileges for faculty, and in most cases graduate and undergraduate students, among consortial participants. Librarians have also relied on the Alliance courier service to physically transport documents throughout the region.

For more than a decade, the librarians have worked together on consortial, technology-based projects.

- Because "resource sharing assumes that library users will routinely have the means to identify and locate needed material,"[2] Alliance members have contributed to the regional Union List of Serials (OCLC) and a Union List of Media for over a decade. To ensure consistent data entry, this operation has been centralized in the Alliance office.
- To stimulate the retrospective conversion of printed cataloging records to machine-readable form, directors began an Electronic Regional Library Catalog (CD-ROM project) in the mid-1980s. This effort was an early attempt to provide enhanced regional access to academic libraries' collections. The intention was to subsequently develop a regional online union catalog.[3] This idea was abandoned, however, given the current distributed environment, so the CD-ROM catalog is no longer updated.

Rather, libraries' end-users depend on the Internet for access to other institutions' online public access catalogs (OPACs). In the absence of fully operational Z39.50 compliant interfaces among the several commercial automation systems represented in members' libraries, some institutions have chosen to offer OCLC WorldCat search services, thereby globally extending end-users' bibliographic access options. Alliance members also voted recently to constitute a Group Access Capability (GAC) through

OCLC, so as to encourage interlibrary lending through designation of a subset of the Alliance members' holdings for resource sharing purposes.

Contemporary Consortium Initiatives

Such technological changes will continue to impact the operation of libraries and the provision of information to library users, at ever increasing rates. Because of their varying institutional missions -- and their consequentially different needs for information access -- member institutions differ in their current technology uptake choices.

- About two thirds of the twenty-six academic institutions have access to Internet data transfer. This information retrieval capability supports searching online library catalogs and accessing remote databases.
- Six research institutions provide digitized, electronic full text document transfer. This high speed, high resolution document delivery technique (Research Library Group's Ariel) "out faxes" conventional fax and relies on Internet transmission.

Neither of these technologies is owned by all member institutions, although the notion of high speed, digitized transmission of documents among consortium institutions is emerging as a desirable standard. Through an extensive committee structure, library directors and their professional staff have been engaged in a series of planning activities intended to chart the pathway to achievement of a "distributed virtual library." The Alliance library program mission statement was recently revisited and re-drafted by a special task force of library directors.

The Alliance for Higher Education is committed to supporting member institutions' improved access to needed information resources. Within a shared framework of commitment to resource sharing, interlibrary activities are intended to support enhanced awareness of the strengths -- and deficiencies -- of other libraries, to expedite more efficient referrals and requests.[4]

In the past several months, these concepts have been operationalized through a variety of interinstitutional collaborations.

- At the invitation of one member institution, Alliance staff agreed to host an interinstitutional conference to teach chemistry professors to train their undergraduate students to use the Internet to access chemistry databases. Concurrently, these professors will assess the state-of-the-art of information access in chemistry, for the purpose of informing a second year demonstration grant application by that member institution.

- Secondly, at the request of six member institutions not yet connected to the Internet, Alliance staff have submitted a grant to the National Science Foundation (NSF) to provide these institutions with monies to defray the costs of the first two years of their connection to the Texas State THEnet via the University of Texas at Dallas (UT-D) Internet node. In this joint venture, UT-D has agreed to maintain the technical connection, and the Alliance has agreed to provide the "train the trainer" instruction which will ensure widespread Internet usage by participating campus' administration, faculty, staff, and students. The Alliance member institutions are responsible in turn for ensuring that an adequate campus wide network backbone makes the Internet accessible from the professor's and the president's desktop. In its maturity, such a fully elaborated infrastructure could support a regional "preferred future," such as that described recently by Dr Richard Dougherty, in which users would possess "universal access by faculty and students to multiple information resources in all possible media via single multifunctional workstations."[5]

Through consortial grant applications which directly address the current disparities between high tech and low -- or no -- tech member institutions, the Alliance intends to significantly further the information competence of the region. Through gateway access to hundreds of online library catalogs in the United States and abroad and, additionally, to the millions of bulletin boards, data files, and electronic journals accessible on the Internet, North Texas institutions are appreciably increasing their access capabilities.

Such consortium activities are giving new meaning to the concept of interconnectivity between librarians and collections by using human and technical resources necessary to expedite connection. In the development stage are a host of other opportunities for increasing information access.

The potential of interinstitutional cooperation and the "value added," facilitative role which the Alliance can assume in support of a regional information infrastructure, are seen in the following initiatives.

- Discounts are available on individual institutional database subscriptions through the "economies of scale" possible through group purchase. Some vendors offer discounts for orders of "x" or more. A single institution may save upwards to 20% on subscription charges for over 150 of the most popular CD-ROM databases.

- Some vendors permit shared access to remote online database hosts. For instance, half a dozen institutions may share 10 "concurrent user" lines, thereby reducing appreciably what any single institution would pay.
- Sharing subscription costs for electronic databases is possible through negotiation of an interinstitutional licensure agreement which is fully copyright compliant. The possible roles for the Alliance range from serving as the negotiator of the contract to, more ambitiously, centrally hosting databases.

There is widespread recognition that libraries need more extensive and more economical access to both print and electronic resources. Clearly, even a modest reduction in duplicate holdings -- and consequential reallocation of funds -- could increase the depth and breadth of regional information resources. The goal, therefore, must be "to minimize unnecessary duplication and to broaden available resources."[6]

Movement toward achievement of this ideal is also in the planning stages. Such cooperative interinstitutional collection development initiatives require articulation of a process for achieving new levels of resource sharing including:

- interinstitutional agreements which specify the rights and responsibilities of the participants,
- consortial (or "group") agreement on the process for de-selecting duplicates and selecting new holdings, and
- coordination of the acquisition, storage, copyright compliance, and document delivery processes for jointly acquired electronic resources, including multimedia, as well as traditional print formats.

Planning is proceeding slowly, mindful that participation in such a program of cooperative collection management will require considerable "documentation of its value to the institution, as well as careful justification of its costs,"[7] as will the joint database purchasing program activities.[8]

> "The degree to which such sharing will necessarily result in cost savings is difficult to determine at this juncture. New paradigms governing local collecting and sharing within consortia will entail new economic relationships among publishers, vendors, and libraries. New pricing schemes will be related to the resolution of copyright issues.

> ... the new technologies ... will require reallocation of resources away from expenditures associated with building a self-sufficient collection and toward those associated with cooperative collection development and sharing. The aggregate cost to individual institutions may not be lower, but access to larger universes of material may be facilitated.[9]

But one thing is clear: under no circumstances must "those who fund ... libraries ... misunderstand the purpose of resource sharing and use it as a rationale for further reducing library appropriations."[10]

Consortial Promise and Challenges

To add to the complexity of contemporary consortial decision making, vendors promise technological advances which will further transform the information environment. Conventional document delivery services, with a turn around time of 24 hours by fax, will soon be augmented by digitized, "on demand" document delivery capabilities. In such a scenario, while a user is reviewing an index to the literature of his or her field, s/he can -- quite simply -- order a full text, digitized document transmitted instantly over the Internet by pressing the designated key on the computer keyboard. At the same time, automation vendors are working toward compliance with open systems interconnection (OSI) protocols which would allow information seekers to use standard commands, regardless of the particular library catalog or database.

Significant differences exist among member libraries, in terms of both collections and technologies, which threatens consortial unity. For instance, because 58% of the titles owned by Alliance institutions are unique, the 7 member institutions which are currently unconnected to the Internet favor projects which promote enhanced regional linkages (and, through that, access to all automated library catalogs). Two other cadres of directors, with automated library system vendors which offer expensive system enhancements, prefer grant writing initiatives which would directly benefit only the small number of institutions with the vendors' products. The differing situations of different sets of libraries yield varying perspectives on appropriate consortial initiatives beyond the basic, core services in direct support of resources sharing such as the courier service, the onsite courtesy card program, and the joint purchasing program.

The fee structure distinguishes between this basic service package and special project support. Alliance staff involvement in any elective projects requires payment of service fees by those participating institutions, which are additional to the basic participation fee shared equally by all 26 institutions. Several such initiatives are under investigation, which would involve only a subset of the total membership -- and would therefore be "charged back" only to them, including shared remote storage for infrequently circulated library holdings and a shared repository for state and federal government documents.

Understanding of how Alliance consortial participation can best advance the enhancement of the region's library infrastructure will continue to evolve, impacted by new developments in the information industry and complicated by the legal, economic, and political dimensions of interinstitutional cooperation.[11] To this must be added the considerable management and governance issues that must be resolved,[12] and, relatedly, value and cost issues.[13]

One aspect of "cost" which has continued to receive considerable attention from consortium members is the significant differences in levels of lending and borrowing among the research institutions, private and public liberal arts colleges and universities, and vocational colleges which constitute the membership. As stated earlier by Dr. Dougherty, interlibrary lending and borrowing must be structured so each institution contributes its share.[14]

Clearly, technology alone will not ensure improved information access, although it is certainly a prerequisite. In the recognition that it is people working in teams who, ultimately, achieve cooperative development goals,[15] library directors will begin this fall to explore the educational needs of librarians, as well as paraprofessional employees, who must learn to better integrate information technology into their work. Strategies for cultivating behavioral changes conducive to collaborative interdependence will also be explored. Training and instruction could appreciably advance the cooperative's goal "to provide the best possible information service for the available funds.[16]

The Alliance membership will continue to strive for "synergistic solutions to dynamic problems and opportunities."[17] In these changing times, the library consortium's goals will have to be frequently re-visited in order to ensure the transformation of regional library environments, necessary to the perpetuation of North Texas' economic and intellectual vitality.

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Evaluating Electronic Resources : A Study Using Three Concurrent Methods

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Abstract

In 1991, the University of Illinois Library introduced the BRS Search Software with thirteen commercial journal citation databases, along with a locally-developed intelligent interface that facilitates uniform searching across the databases. This was the most recent addition to ILLINET Online -- an online catalog consortium consisting of forty libraries in Illinois. The most

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popular search access point has proved to be keywords or phrases, which users employ primarily in uncontrolled vocabulary subject searches. While research documented a profound shift from the use of print to electronic resources, library staff observed that users were having difficulty in obtaining the desired results when they chose the keyword search option. However, no one evaluation method provided sufficient information to determine the causes of these problems, and their potential resolution.

This paper describes a study that examined the instances and causes of problems with keyword subject searching of journal citation databases. The researchers employed three methods, and in so doing, tested their viability in developing a cohesive record of user searching activities and attitudes: transaction log analysis, survey questionnaire, and protocol analysis. Two types of recommendations emanate from this research: 1) suggestions for practical enhancements to interface software design; and 2) a new methodological approach to the study of user searching behavior in online systems.

> *"Just as Professor Richard Alpert and I studied the mind-transforming properties of LSD by booting-up divinity students, artists, prison inmates, and ourselves, today's human interface designers are about to unleash equally undreamed-of changes in the consciousness of people all over the world by giving them a tool for expanding the power of their minds."*
>
> *Timothy Leary*[1]

1.0 Introduction

In his recent musings, Timothy Leary equates the impact of user interface design and its goal of expediting access to seemingly limitless information with the impact of his LSD-related psychological experiments in the 1960s. While I do not intend to debate the impact of the first part of Leary's statement, all of us have had at least one mind-altering experience with a user interface to gain access to one or more information sources. The user interface, whether it is transparent or obvious, acts, as Leary suggests, as a window to the resources that new technologies and human agreement make possible.

At any given moment of the day, users are pioneering their ways into the collections of hundreds of libraries and other information resources across the Internet. They employ search options that range from simple author or title to Boolean logic and set building. Mostly they use commands or options with which they are familiar, and research shows that they prefer subject searching if it is available. The research of Peters and Kurth suggests that remote searchers prefer to use their own words to describe a subject term, rather than to create a subject term that conforms to LCSH.[2] For many users, the keyword search appears to offer a simple solution to the problem of not knowing the correct subject terms. Although the keyword search is not equivalent to a subject search using controlled vocabulary terms, it has provided a convenient entry point for users, and for many, it is an end in itself.

This paper describes a research project that examined the instances and causes of problems with subject searching in journal citation databases. More specifically, it examined the use of keyword searching as a means of subject searching, along with the use of Boolean logic, and query formation and reformulation. This research was carried out in March and April, 1993 at the University of Illinois at Urbana-Champaign, where there is a consortium of 40 libraries in the state of Illinois who share a union catalog, as well as access to over a dozen commercial journal citation databases, including Current Contents, the Wilson Indexes, and CARL UnCover. The information presented here represent preliminary results.

2.0 The University of Illinois Online System

Since the early 1980s, the Library and the ILCSO consortium (Illinois Library Computer Systems Organization) have had a locally-developed PC-based user interface that enables users to search the catalog using natural language queries.[3] With the BRS Search Software and access to over 12 million journal citations, the Library expanded the PC interface to offer consistent natural language searching across the journal citation databases. The sum total of this product is ILLINET Online Plus (ILlinois Library Information NETwork).[4]

One of the strengths of the interface is the fact that a search can be submitted to a number of databases simultaneously. Also, the interface provides call numbers and locations for the journal titles linked to each citation, for journals owned by the Library.

In effect, this innovation brought the Library one step closer to providing "one-stop shopping" for users. The cost of this initiative is borne by the University of Illinois and the ILCSO consortium, and searching, downloading, and printing of citations is free to users who are registered borrowers in the participating libraries within the ILCSO consortium. The cost of an average search, including a printed list of citations, was calculated in 1992 to be as low as $15 US.

2.1 Research Questions

In 1992, twelve months after the BRS Search Software and the citation databases were mounted, and users had logged over half a million searches, preliminary evaluation was performed in two separate but concurrent research projects. It was found that users from all subject disciplines had made a profound shift from using printed indexes to using IO Plus (Illinois Online Plus) to find journal citations.[5] The second project involved an examination of aggregate user searching characteristics in an attempt to understand whether the interface was truly facilitating users' searching. This work was spearheaded by Prof. William Mischo, the developer of the interface and a strong proponent of the concept of the scholar's workstation at the University of Illinois. Early on, Mischo found that over 70% of the searches he reviewed were keyword, and 15% of these searches had obvious problems with search strategy formulation.[6] But, aggregate statistics could not reveal whether individual searchers were making the same types of choices and mistakes. A closer examination of what users were doing at the keyboard was necessary. Through informal observation of users at public access terminals, and through formal classroom instruction, librarians began to ask several key questions:

1. Can users find what they want?
2. Are the search options effectively used?
3. How can these questions be tested?

2.2 Stages in a Search

Essentially, a search in the IO Plus interface comprises three main stages:

1. Choosing a database;
2. Choosing a search type;
3. Reformulating, displaying, or manipulating existing sets and results.

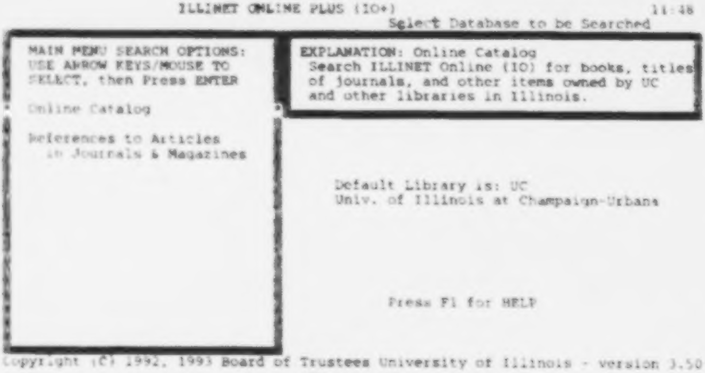
A more detailed analysis of the choices available within each of these options can be seen in the sample screens.

Users can begin searching the journal citation portion of the catalog by choosing the "Reference to articles" option from the main menu screen in the IO Plus interface **(Figure 1)**. Once a user has indicated a search in the journal citation databases, the second screen lists four categories of databases that are available with a brief description of the contents: 1) Wilson Indexes; 2) Current Contents; 3) ERIC (Educational Resources Information Clearinghouse); or 4) CARL UnCover (Colorado Alliance of Research Libraries) **(Figure 2)**. Although CARL is included as a search option, it provides its own commands and menus. The searcher is asked to highlight the choice of database. Depending on which database is chosen, the next screen provides a more detailed description of the various files contained in the various indexes. For example, **figure 3** indicates that the Wilson Indexes have been chosen. On the left-hand side of the screen, a summary of the various subject area indexes contained in the Wilson Files is provided. The searcher can opt to search a specific file, or all seven of the Wilson Indexes combined. Likewise for Current Contents in **figure 4**, the searcher may choose to search one of the Current Contents subject-specific files, all of Current Contents combined, or the latest week. The same or similar choices are offered in **figure 5** for the ERIC database.

Once the searcher has chosen a database, the next menu provides a selection of search types **(Figure 6)**. At each step, when a searcher moves the cursor downward to highlight each separate option on the left-hand side of the screen, a corresponding brief explanation of the search appears in a box on the right-hand side of the screen. The searcher can even consult a diagram of Boolean AND and OR logic if he or she so desires.

After choosing a search type, the user enters the first concept. Once the concept is typed and entered into a display box, another screen prompts the searcher to provide "synonyms or related terms" for the first concept **(Figure 7)**. Other options such as finishing the concept or moving on to form the next concept are provided, although they are not highlighted as prominently on the screen. The prompt for synonyms reiterates until the user decides to finish the concept **(Figure 8)**. After the concept is finished, the resulting hits in the set are reported, and the reformulation screen appears, presenting the searcher with eight options for either modifying the current search, beginning new search, or leaving the current database **(Figure 9)**. From this screen the searcher can narrow or broaden the search by creating another or other concepts and combining them with the current concept, delete the current concept or other concepts and combined results, display results of any search, send search results to an e-mail address, review the search set history, begin a new search, or quit. Essentially, the various iterations of searching throughout the interface program are built using these screens.

(continuation on page 71)



```
                    ILLINET ONLINE PLUS (IO+)                              11:48
                                          Select Database to be Searched
 MAIN MENU SEARCH OPTIONS:     EXPLANATION: Online Catalog
 USE ARROW KEYS/MOUSE TO        Search ILLINET Online (IO) for books, titles
 SELECT, then Press ENTER       of journals, and other items owned by UC
                                and other libraries in Illinois.
 Online Catalog

 References to Articles
   in Journals & Magazines

                                   Default Library is: UC
                                   Univ. of Illinois at Champaign-Urbana

                                          Press F1 for HELP

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```
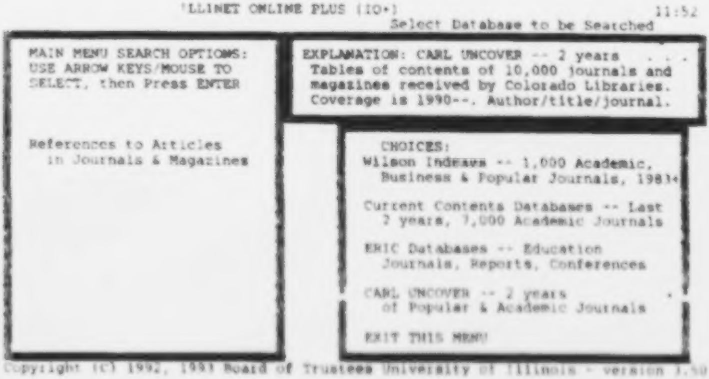

Figure 1



```
                    ILLINET ONLINE PLUS (IO+)                              11:52
                                          Select Database to be Searched
 MAIN MENU SEARCH OPTIONS:     EXPLANATION: CARL UNCOVER -- 2 years   . . .
 USE ARROW KEYS/MOUSE TO        Tables of contents of 10,000 journals and
 SELECT, then Press ENTER       magazines received by Colorado Libraries.
                                Coverage is 1990--. Author/title/journal.

 References to Articles               CHOICES:
   in Journals & Magazines          Wilson Indexes -- 1,000 Academic,
                                      Business & Popular Journals, 1983+

                                    Current Contents Databases -- Last
                                      2 years, 7,000 Academic Journals

                                    ERIC Databases -- Education
                                      Journals, Reports, Conferences

                                    CARL UNCOVER -- 2 years
                                      of Popular & Academic Journals

                                    EXIT THIS MENU
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```
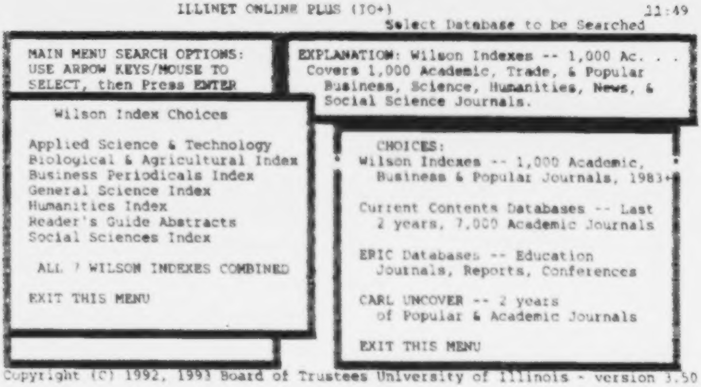

Figure 2



```
                ILLINET ONLINE PLUS (IO+)                          11:49
                                     Select Database to be Searched
MAIN MENU SEARCH OPTIONS:        EXPLANATION: Wilson Indexes -- 1,000 Ac. . .
USE ARROW KEYS/MOUSE TO           Covers 1,000 Academic, Trade, & Popular
SELECT, then Press ENTER            Business, Science, Humanities, News, &
                                    Social Science Journals.
    Wilson Index Choices
                                       CHOICES:
Applied Science & Technology         Wilson Indexes -- 1,000 Academic,
Biological & Agricultural Index        Business & Popular Journals, 1983+
Business Periodicals Index
General Science Index                Current Contents Databases -- Last
Humanities Index                       2 years, 7,000 Academic Journals
Reader's Guide Abstracts
Social Sciences Index                ERIC Databases -- Education
                                       Journals, Reports, Conferences
 ALL 7 WILSON INDEXES COMBINED
                                     CARL UNCOVER -- 2 years
EXIT THIS MENU                         of Popular & Academic Journals

                                     EXIT THIS MENU
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```
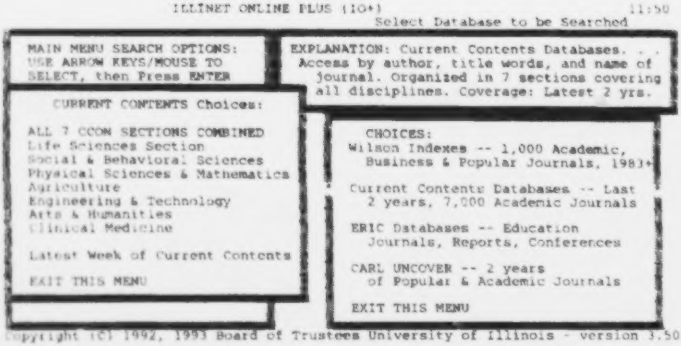

Figure 3



```
                ILLINET ONLINE PLUS (IO+)                          11:50
                                     Select Database to be Searched
MAIN MENU SEARCH OPTIONS:        EXPLANATION: Current Contents Databases. . .
USE ARROW KEYS/MOUSE TO           Access by author, title words, and name of
SELECT, then Press ENTER             journal. Organized in 7 sections covering
                                     all disciplines. Coverage: Latest 2 yrs.
   CURRENT CONTENTS Choices:
                                       CHOICES:
ALL 7 CCON SECTIONS COMBINED         Wilson Indexes -- 1,000 Academic,
Life Sciences Section                  Business & Popular Journals, 1983+
Social & Behavioral Sciences
Physical Sciences & Mathematics      Current Contents Databases -- Last
Agriculture                            2 years, 7,000 Academic Journals
Engineering & Technology
Arts & Humanities                    ERIC Databases -- Education
Clinical Medicine                      Journals, Reports, Conferences

Latest Week of Current Contents      CARL UNCOVER -- 2 years
                                       of Popular & Academic Journals
EXIT THIS MENU
                                     EXIT THIS MENU
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```
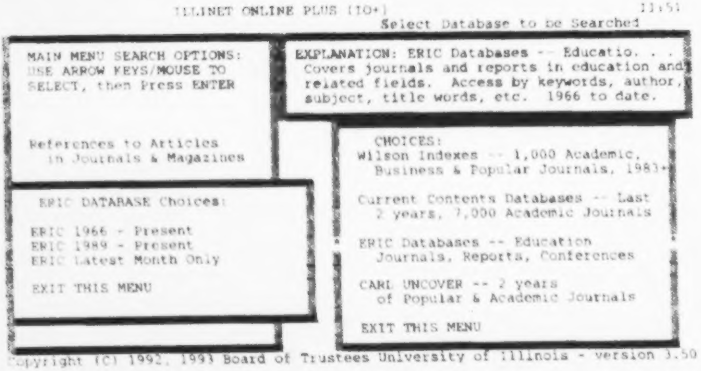

Figure 4



```
ILLINET ONLINE PLUS (IO+)                                       11:51
                                    Select Database to be Searched

MAIN MENU SEARCH OPTIONS:        EXPLANATION: ERIC Databases -- Educatio. . .
USE ARROW KEYS/MOUSE TO           Covers journals and reports in education and
SELECT, then Press ENTER          related fields.  Access by keywords, author,
                                  subject, title words, etc.  1966 to date.

                                      CHOICES:
References to Articles           Wilson Indexes -- 1,000 Academic,
  in Journals & Magazines          Business & Popular Journals, 1983+

  ERIC DATABASE Choices:         Current Contents Databases -- Last
                                   2 years, 7,000 Academic Journals
 ERIC 1966 - Present
 ERIC 1989 - Present             ERIC Databases -- Education
 ERIC Latest Month Only            Journals, Reports, Conferences

 EXIT THIS MENU                  CARL UNCOVER -- 2 years
                                   of Popular & Academic Journals

                                 EXIT THIS MENU
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```
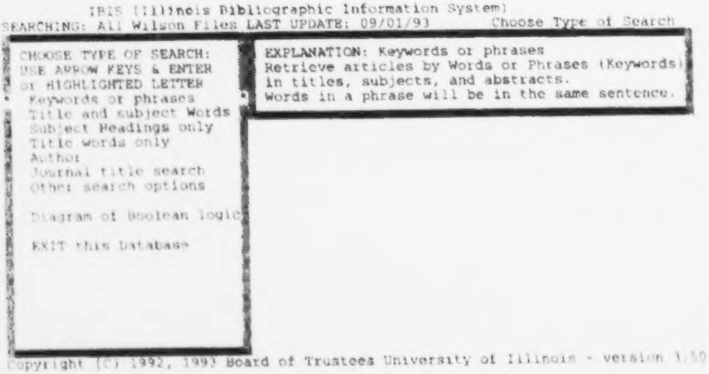

Figure 5



```
          IBIS (Illinois Bibliographic Information System)
SEARCHING: All Wilson Files LAST UPDATE: 09/01/93       Choose Type of Search

CHOOSE TYPE OF SEARCH:        EXPLANATION: Keywords or phrases
USE ARROW KEYS & ENTER        Retrieve articles by Words or Phrases (Keywords)
or HIGHLIGHTED LETTER         in titles, subjects, and abstracts.
 Keywords or phrases          Words in a phrase will be in the same sentence.
 Title and subject Words
 Subject Headings only
 Title words only
 Author
 Journal title search
 Other search options

 Diagram of Boolean logic

 EXIT this Database

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```
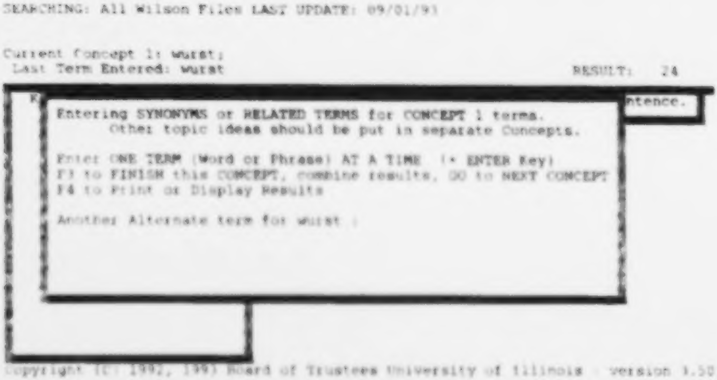

Figure 6



```
SEARCHING: All Wilson Files LAST UPDATE: 09/01/93

Current Concept 1: wurst;
 Last Term Entered: wurst                                        RESULT:   24

 K                                                                   ntence.
   Entering SYNONYMS or RELATED TERMS for CONCEPT 1 terms.
         Other topic ideas should be put in separate Concepts.

   Enter ONE TERM (Word or Phrase) AT A TIME  (+ ENTER Key)
   F3 to FINISH this CONCEPT, combine results, GO to NEXT CONCEPT
   F4 to Print or Display Results

   Another Alternate term for wurst :

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```
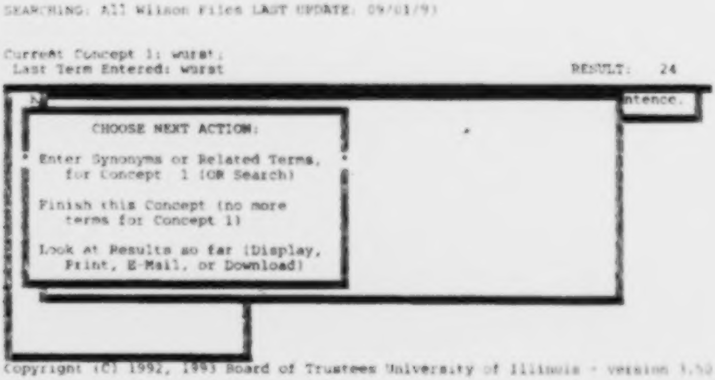

Figure 7



```
SEARCHING: All Wilson Files LAST UPDATE: 09/01/93

Current Concept 1: wurst;
 Last Term Entered: wurst                                        RESULT:   24

 N                                                                   ntence.
        CHOOSE NEXT ACTION:

  Enter Synonyms or Related Terms,
     for Concept  1 (OR Search)

  Finish this Concept (no more
     terms for Concept 1)

  Look at Results so far (Display,
     Print, E-Mail, or Download)

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```
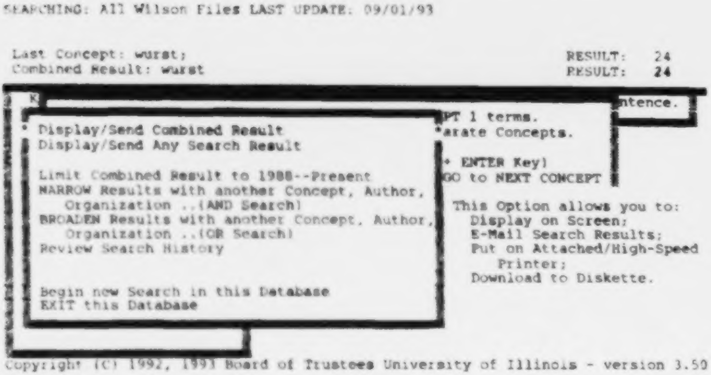

Figure 8



```
SEARCHING: All Wilson Files LAST UPDATE: 09/01/93

 Last Concept: wurst;                                                RESULT:    24
 Combined Result: wurst                                              RESULT:    24

   K                                                               ntence.
                                                     PT 1 terms.
 • Display/Send Combined Result                     •arate Concepts.
   Display/Send Any Search Result
                                                     • ENTER Key)
   Limit Combined Result to 1988--Present           GO to NEXT CONCEPT
   NARROW Results with another Concept, Author,
      Organization ..(AND Search)                     This Option allows you to:
   BROADEN Results with another Concept, Author,        Display on Screen;
      Organization ..(OR Search)                        E-Mail Search Results;
   Review Search History                                Put on Attached/High-Speed
                                                           Printer;
                                                        Download to Diskette.

   Begin new Search in this Database
   EXIT this Database

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```
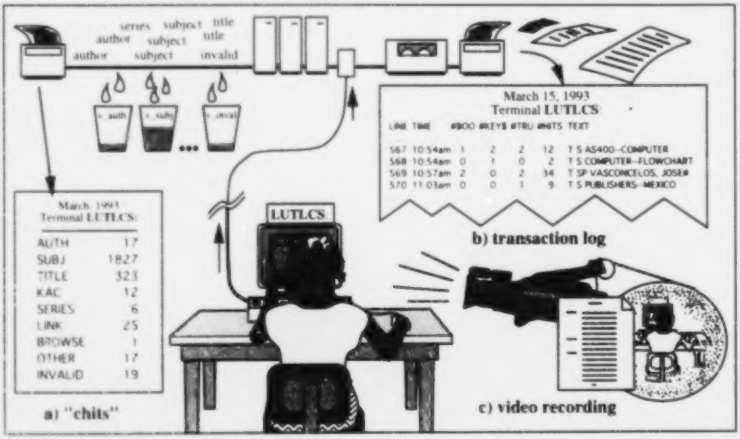

Figure 9



```
March 1993
Terminal LUTLCS:

AUTH          17
SUBJ        1827
TITLE        323
KAC           12
SERIES         6
LINK          25
BROWSE         1
OTHER         17
INVALID       19
```

```
                     March 15, 1993
                     Terminal LUTLCS

LINE TIME       #BOO #KEYS #TRU #HITS TEXT

567  10:54am    1    2     2    12    T S AS400--COMPUTER
568  10:54am    0    1     0     2    T S COMPUTER--FLOWCHART
569  10:57am    2    0     2    34    T SP VASCONCELOS, JOSE#
570  11:03am    0    0     1     9    T S PUBLISHERS--MEXICO
```

Figure 10

3.0 Current Research

Most studies of online catalog user searching activity have employed either transaction log analysis, survey questionnaires to analyze demographic data, or, in some few instances, focus group interviews or protocol analysis to provide a view of how and why users make decisions while they are searching. As **figure 10** suggests, the results of conducting a search can be recorded in at least three ways: 1) as summary data on paper; 2) as a transaction log that maps the keystrokes of the user and the machine responses; or 3) as a fully-contextualized recording including, if possible, video, and accompanying verbal protocols. In a recent study of the search patterns of remote users of the University of California-Berkeley MELVYL OPAC system, Millsap and Ferl note the difficulties of visual analysis of transaction log data, and the absence of any information in transaction logs to provide background on the user, and on the intent of the search.[7]

Transaction log analysis has been used as a method for unobtrusive analysis of user search patterns in the library setting for well over a decade.[8] Peters establishes a working definition of transaction log analysis as "...the study of electronically recorded interactions between online information retrieval systems and the persons who search for the information found in those systems."[9] Transaction logs are useful for tracing the "footprints" of a searcher throughout a search, and they can be used to examine overall patterns of searching in user groups. A limitation of transaction log analysis is that it does not provide for analysis of the individual user's searching intentions or decisions during the course of a search session.[10] In the early 1980s Tolle and others at OCLC used the Markov chain method to predict the how a searcher's prior decisions affected subsequent decisions and the final outcomes of a search.[11]

Protocol analysis and searcher interviews have been employed in library research studies by Dalrymple, and Tenopir, et al [12, 13]. Protocol analysis involves getting the searcher to "think aloud," while formulating and refining a search strategy, and manipulating the search results. It involves recording or transcribing the searcher's comments and reflections. While this approach is labor-intensive, it is informative and can assist in revealing individual searching behaviors and attitudes. Searcher interviews are normally carried out after the searching has taken place. The qualitative method of protocol analysis provides a basis for analyzing user searching that transaction log analysis alone cannot; protocol analysis attempts to describe the mental steps taken by searchers to arrive at a particular decision about the path of the search. It was the belief of the authors that a combination of transaction log analysis, demographic information, tests of the user's skill with Boolean logic and set formation, and protocol analysis would yield the most comprehensive analysis of user searching behavior and search strategy formulation than any of the three methods employed in isolation. We also felt that the results of this research would contribute to ongoing work to develop both descriptive and analytical search taxonomies, and a taxonomy of searching competence, put forward by Bates, Peters and Kurth, and Jakobovits and Nahl-Jakobovits.[14 15 16]

4.0 Methodology

The objective of the study was to test "naive" users, not well-seasoned researchers, since undergraduates make up over 60% of the potential user population in the University of Illinois community. The target test group was first-year undergraduate students enrolled in the English Department's Rhetoric 105 course. Eighteen out of 24 volunteers completed a one-hour test session each. We attracted these students by offering the incentive of coupons for a free lunch at a local restaurant. During the session, each student read a short article on the topic of food advertising, and was asked to do a search for a list of up to ten citations on some topic related to food advertising. Each was outfitted with a clip-on microphone and asked to "think aloud" during the time he or she was searching. After approximately 35 minutes, participants were asked to finish the search. Then, each completed a multiple choice survey questionnaire online, at the same terminal that was used for the search.

4.1 Transaction Log Analysis

The 1992 analysis used transaction logs of user searching, which are useful for tracing the "footprints" of a search by recording the user's keystrokes and the computer's responses. However, there were limits to what the transaction logs could reveal. For example, it was unclear how a searcher could make the combination "education OR history", and, retrieving well over 50,000 matches, could find what he or she had come looking for. Equally unclear was the usefulness of excessive combinations of concepts using the Boolean AND, such as "Los Angeles riots" AND "Rodney King" AND "Darrell Gates". Therefore, in the design of this study, we started with transaction logs, and combined that method with two additional methods -- survey questionnaire and protocol analysis.

4.2 Protocol Analysis

Protocol analysis enabled us to map some missing and crucial information from the search sessions, and add it to the transaction logs. Using this, we devised a method of coalescing protocol analysis information with transaction logs to produce an enriched transaction log that reflected all user choices. It was a useful vehicle for delving into the "why" behind searchers' choices of terms and access points. Using this method we were also able to capture user comments and suggestions, some of which were quite expressive and meaningful.

4.3 Survey Questionnaire

The survey questionnaire was used for several reasons. First, as a critical incident survey to allow users to "self report" what they believed they did during the search session. Next, the survey tested participants' familiarity with the Boolean operators AND and OR, and their ability to identify discrete concepts within a typical search strategy example. After reviewing over 250 transaction logs of searches, we found that the average search consisted of two concepts. This finding confirms the 1992 research of Mischo, Cao and Cole. It is also corroborated by other unrelated OPAC studies. We also tested for significant relationships among several pairs of variables, including gender and frequency of computer use; this analysis will be forthcoming in a future publication.

5.0 Results

5.1 Questionnaire Results

Highlights of the questionnaire results are reviewed here. **Table 1** shows that a majority of the participants felt that the search they completed took either "a short time" or "not too long." The average amount of time spent searching was 35 minutes for each session. There was no consensus about how difficult it was to produce the list of citations in the search -- participants were equally divided about how difficult this was. An overwhelming majority of searchers indicated that the "keyword or phrases" option for searching was the best search type to employ. Twenty-two percent chose "title and subject words" or "subject headings only." Over half of the participants found the directions for building a search concept in the interface were either "fairly easy" or "easy," while 40% found them to be either "very hard" or "somewhat hard." A majority of the searchers indicated that it was either "fairly easy" or "easy" to follow the instructions for combining words in a search. Interestingly, over half of the searchers found it either "somewhat hard" or "very hard" to think of the right words to describe their topic. This reported difficulty is similar to findings in the research of Peters and Kurth and others.[2]

CHOICE OF SEARCH AND CLARITY OF INTERFACE INSTRUCTIONS

1. **Length of time it took to produce the list of articles:**
   70% "a short time: or "not too long" (average search time was 35 minutes)
2. **Participants were equally divided about how difficult it was to produce the list of citations from the search**
3. **The "best" search type:**
   78% chose "keywords or phrases"
   22% chose "title and subject words" or "subject headings only"
4. **Clarity of instructions on the screen and concept formation:**
   60% found it "fairly easy" or "easy" to create a concept in the search using instructions on the screen
   40% found it either "very hard" or "somewhat hard"
5. **Following instructions for combining words in a search:**
   84% found it either "fairly easy" or "easy"
6. **Thinking of the right words to describe a topic:**
   60% found it either "somewhat hard" or "very hard"

Table 1

On the topic of reformulation and manipulating search results to retrieve a desired set of citations, 73% of the participants reported that they found it either "fairly easy" or "easy" to narrow a search when they retrieved too many matches **(Table 2)**. Subjects were divided about the use of broadening, with 27% reporting that this was "very hard," "hard" or "somewhat hard." Thirty-four percent found it "fairly easy" or "easy," while 39% of the participants reported that they did not used broadening during their search sessions. In the area of recovering from a search that retrieved no matches, 38% of the participants found it "very hard," "hard" or "somewhat hard," 28% reported it was either "fairly easy" or "easy," and 39% noted that they did not encounter this problem during the search session. In the cases where participants reported that they did not use either the broadening or encounter the "no hits" situation, the transaction logs corroborated that they had indeed correctly reported what had occurred during the search sessions. In terms of deciding relevance of information retrieved, 80% of the participants reported that it was either "fairly easy" or "easy" to decide whether the articles they retrieved matched their search topic.

REFORMULATION

1. **Narrowing:**

   73% found it either "fairly easy" or "easy" to know what to do when they found too many articles

2. **Broadening:**

   27% found it "very hard," "hard," or "somewhat hard"
   34% found it "fairly easy" or "easy"
   39% reported this did not occur during their search (corroborated by the transaction logs and the protocol analysis)

3. **Recovering from a "No Hits" search result:**

   38% found it "very hard," "hard," or "somewhat hard"
   28% found it "fairly easy" or "easy"
   39% reported the problem did not occur during the session

Table 2

Also included in the questionnaire were several simple questions that tested the participants' ability to correctly use Boolean operators and to correctly identify separate concepts within a search. **Table 3** shows that participants had overall little or no problems with questions about the Boolean AND and OR operators, or the meaning of the terms "broaden" or "narrow." However, the overall ability of participants to correctly identify discrete concepts in search strategy formation was lower, at the 67% level. All participants indicated that if they retrieved a set of over 300 citations, they would first review some of these citations, and then proceed to narrow the search based on information from some of the citations in the search.

SEARCH STRATEGY FORMULATION. KNOWLEDGE OF BOOLEAN OPERATORS

- 67% correctly interpreted the elements that make up a separate search concept
- 95% could correctly apply the function of the terms "narrow" and "broaden"
- 100% could correctly distinguish between Boolean AND and OR in a search argument
- 100% would, if they retrieved more than 300 citations in a search, "look at some of them, then narrow the search based on what I saw"

Table 3

The survey also collected demographic information and information about the frequency of computer use among the participants. **Table 4** reveals that most participants reported that they use the Library's online system at least one to three times per month. Nearly 60% of the subjects reported that they used computers at least one to six times per week, and 66% reported using computers for over five years. The majority of participants were freshmen, or first-year undergraduates, with 41% women and 59% men participating in the testing.

Overall, the subjects in the study reported that the interface screens that guided them to create a search strategy were clearly stated and easy to use. Participants chose either keyword or subject searching consistently throughout the sessions. "Keywords or phrases" was reported as the preferred access point for an overwhelming majority of the searchers, with "title and subject words" or "subject headings" being the only other search types chosen throughout the 18 search sessions. They also demonstrated a very good to excellent ability to correctly interpret and apply the Boolean AND and OR operators. Participants scored comparatively lower on questions requiring them to identify discrete concepts in a search strategy. Subjects reported that they had problems choosing the right terms to create a concept in a search, and knowing what to do after retrieving no matches as a search result.

FREQUENCY OF COMPUTER USE, DEMOGRAPHIC CHARACTERISTICS

1. **Library Online system:**

   28% use 1-6 times per week
   39% use 1-3 times per month
   17% use 1-3 times per semester
   5% never use

2. **Computers in General:**

   28% use every day
   59% use 1-6 times per week
   11% use 1-3 times per month

3. **Length of time using computers:**

   17% 1-2 years
   17% 3-4 years
   66% 5+ years

4. **Undergraduate status:**

   83% freshman
   12% sophomore
   5% junior

5. **Sex:**

   41% female
   59% male

Table 4

5.2 Combined Results of Transaction Logs and Protocol Analysis

The aggregated information from the protocol analysis and transaction log analysis was synthesized, yielding some interesting results. **Table 5** indicates that most participants used one database for the entire search session. Out of the 27 total times databases were chosen, the searchers repeatedly selected the combination of all Wilson indexes, which is the most comprehensive selection among the thirteen available choices. Fifty percent chose this combination at least once. Eight of the eighteen confined their searches to the database initially chosen for the entire search session.

Of the six types of search available, the study participants chose subject access for only 11% of all searches performed. A third type, combined title and subject access, was used for only eight percent of the searches. None of the 144 individual searches performed by the 18 subjects used the options provided for "author," "journal title," or "title words only." When asked during the search sessions about their reasons for these choices, many of the students said that they wanted to get the "most," or start "broad" and restrict their results later if necessary.

The choices of the majority of the searchers in both selection of preferred database, and selection of search type, indicates a preference for the most expansive initial retrieval possible. Despite the availability of individual subject-specialized databases, and specialized search access points, which arguably, if selected, are capable of producing a greater percentage of records relevant to the specific topic being searched, searchers appeared to demonstrate a preference in search strategy that relied more on self-evaluation of retrievals obtained, rather than on the expertise of the underlying system to find sufficient pertinent records.

USER SEARCHING CHOICES

1.	**CHOICE OF DATABASE:**	(N=27)
	Used one database for entire session:	78%
	Wilson indexes combined:	40%
	A specific Wilson index:	26%
	Current Contents files combined:	14%
	ERIC (Educational Resources index):	11%
2.	**SEARCH TYPE:**	(N=144)
	Keyword:	81%
	Subject Headings only:	11%
	Title and Subject words:	8%

Table 5

Once the searcher had selected a database and chosen the type of search desired, and had completed at least one concept, **table 6** reveals that 256 separate instances of reformulation were attempted throughout the 18 search sessions. The top five choices for manipulating information included narrowing, displaying of search results, using synonyms, deleting concepts, or starting a new search in the same database. This information suggests that users spent a significant portion of their searching attempting to narrow concepts and/or retrievals. Synonyms were used to expand retrievals, although not nearly as often as narrowing was used to decrease retrieval. The use of the search results display function suggests that another significant component in searching is periodic evaluation and assessment by searchers of their success in finding records that meet their requirements. The choice of starting a new search in the same database indicates a change in direction of searching, due perhaps to a new idea or a zero-hit retrieval.

REFORMULATION:	(N=256)
Display search results:	15%
Limit:	3%
Narrow:	37%
Broaden:	1%
Synonym:	15%
Delete Concept(s):	10%
Review Search History:	1%
Start New Search (same database):	7%
Exit database (new search or quit):	4%

Table 6

Next, we examined the specific context in which each reformulation choice was made, to determine whether the searchers were experiencing problems refining their searches. Based on this examination we were able to identify four problems users encountered, either in the process of concept formation or reformulation **(Table 7).** Over half of the commands issued after selection of database and search type were to reduce the size of the most recent set retrieved. In over 60% of these cases, this command resulted in zero or one item retrieved. This phenomenon of "feast or famine" retrieval may be the result of strategies that relied on the use of single terms to narrow sets, and either misuse or non-use of a system feature which permitted the addition of synonymous terms immediately after a search term has been entered.

In the instances where a searcher used synonyms and did so correctly, there was a one in four chance that the retrieval would result in zero or one hit. While the use of the synonym option alone did not appear to be problematic, the choice of terms made by the students was either unspecific so as to produce an astronomical and useless retrieval, or turned out to be an untrue synonym, an inappropriate use of the synonym option to form a separate concept.

The most common response to producing zero or one hit was to start a new search, or to try to undo (deletion of the last concept, and the last combined result) or to modify the previous search step. In most cases, the searcher had difficulty modifying the search to produce a usable retrieval. In 7 of 18 searches (40%) where concepts were deleted, searchers encountered problems in modifying the remaining search elements. Despite the apparent alternatives the system presents to users, searchers who ignored the broadening, narrowing, or limiting options seemed to achieve better results than those who tried to use these options. Simply starting a new search often appeared to be the more successful strategy.

PROBLEMS THAT INHIBIT SUCCESSFUL SEARCHING

	(N=18)
Retrieval of 0 or 1 hit by narrowing:	61%
Of these cases, happened 3+ times in a search:	80%
Unrelated Concepts used as synonyms:	21%
Typographical errors causing 0 hit retrievals:	33%
Concept deletion:	40%

Table 7

6.0 Conclusions and Recommendations

The results of this study are two-fold. First, the most immediate results are practical suggestions for improvements of the IO Plus interface. Equally important is the fact that the three methods employed helped in the identification of problems which were perceived by searchers, and also of problems that could only be identified by viewing the search session in a specific context. The combination of the three methods tested here was found to yield rich information tracing the "footprints" of a search, the reasons for users' search choices, and the contexts in which problems occurred. These methods helped to provide a composite picture of user searching, which enabled the isolation of the specific problem areas noted in **table 7.** The following suggestions are based on the most salient problems that were found to affect retrieval and search strategy most profoundly. However, future research with a variety of user groups may reveal similar needs in interface design for greater searching success in these types of systems.

6.1 Help with Subject Terms

All three methods revealed that users are conscious of their own weakness to provide correct or useful subject terms to describe their topic. Lack of the appropriate term appeared to be the biggest hindrance to a successful search. Therefore, we recommend the inclusion of a browsable online thesaurus. This thesaurus or list of alternate terms could be displayed when a user retrieved either zero or no hits in a search. The word list should preferably indicate hierarchical relationships among terms, such as "narrower term" or "broader term" or "use for". Next, along these same lines, while unnoticed spelling errors caused a small number of search failures, these failures were not easily resolved by the searcher. A pop-up thesaurus with the closest match to the term entered could serve the dual purpose of suggesting more terms, and assist in helping the searcher discover a spelling error. Controlled vocabularies of multiple databases both complicate this and make it necessary.

6.2 Synonyms and Related Terms

The current single input box for synonyms or related terms is problematic from the standpoint that a searcher cannot see all of the terms supplied to consider whether the relationships are what they intended in forming the concept. We suggest further using a thesaurus and providing a single input area to help searchers to build synonym "trees," so the searcher can follow his or her steps more easily, to increase the likelihood of sufficient retrieval.

6.3 Additional Boolean Operators

Searcher comments and their performance on the survey indicate that they clearly grasp the Boolean AND and OR functions. Moreover, it is clear from their "thinking aloud" that they could gainfully employ other Boolean operators, such as NOT, or NEAR. At this time, the only way to modify a search strategy is by use of concept deletion, which the transaction logs and the protocol analysis show to be not altogether successful in at least 50% of the cases. Future versions of the interface should test these additions.

6.4 Further Research

The preliminary results reported here suggest that the group of first year college students we interviewed and tested have a fairly sophisticated knowledge of information retrieval concepts. The survey results showed that they correctly understood how to combine Boolean operators, and how to create concepts and combine them in search strategy formation. Their discomfort with creating the appropriate subject terms is expressed in the survey, and is evidenced by their trouble with synonyms, concept deletion, and frequent starts of new searches on the same subject. This performance is corroborated by the transaction logs, and their verbalization of difficulty with terms and iterative operations during the search session in the protocol analysis. However, no single method employed on its own could have provided us with this information.

Evaluating new technologies and resources is just as important as providing them. The work involved in combining these methods is difficult and time-consuming. Ideally, we would like to develop a method or set of methods that librarians could use that would enable testing in a more natural setting. As users continue to expand their access to information that is crucial to their professional and social lives, so, hopefully, will librarians and information scientists refine the methods to evaluate this access, thereby making the searching of these resources more effective.

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IT and Resource Sharing in Scottish Libraries together with a Note on Image Compression Standards

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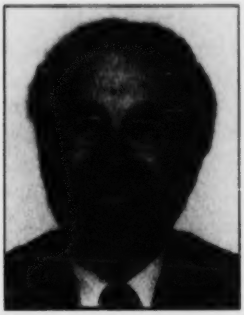

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Abstract

As we move towards the third generation of library systems, librarians in Scotland, once more, are actively working together to ensure that many of the benefits of these new systems are not dissipated through a needless lack of congruity between the many different offerings currently emerging from suppliers. This paper identifies the work of SCURL, SCOLAR and other Scottish committees and some of the ways these committees and techniques such as CONSPECTUS are helping Scottish librarians work together. The paper concludes by looking at the need to identify the right compression standard when selecting a document imaging system and the effect this will have on world-wide resource sharing.

After a quick resume to show how we got to where we are today, I will concentrate on work currently underway in Scotland to promote better sharing of scarce resources and how we are working together to ensure yet better resource sharing in the future. To wind up I would like to spend a few minutes talking about two important image compression techniques and the importance of establishing the right standard in this rapidly emerging area, if we are to share images successfully.

Introduction

I have the dubious distinction of having been involved in library automation in Scotland ever since Scotland first decided it needed to become involved in library automation. In the last 18 years we have progressed from using what, with hindsight, were very primitive batch processing systems, but which were at the cutting edge of developments at the time, to a stage where computers of all shapes and sizes abound in Scottish libraries, large and small, academic and public and some of us are now considering the acquisition of a third or even a fourth library system. Who knows what the next 18 years will bring?

You will remember how those early systems were usually centred on an academic institution and how much they relied on cooperation to be effective; hence the name, cooperative systems. Computers were very expensive at the time and one large computer, at the focus of the operation, serviced the needs of many tens of libraries within the cooperative family. Those systems, using batch processing techniques, held sway for about ten years before commercial suppliers introduced what some then called "stand alone" systems. This expression, so opposite to our current needs and beliefs, at the time, actually attracted librarians tired of being attached to a slow-moving cooperative system. In Scotland, in particular, the "stand alone" systems arrived at just the right psychological moment.

The costs of many of these new systems were an order of magnitude more expensive to buy and operate than the shared services librarians were paying for the local cooperative system. Nevertheless, many of those early, pioneering librarians successfully disguised the true costs of the new systems they desired, or they exaggerated the costs of the old cooperative systems they wanted to replace. They had a need to be able to talk to their peers about their computer systems. It had become very chic, indeed vital, for any self-respecting librarian to acquire and operate his or her own computer system. In addition, as mentioned above, librarians were eager to be in control of their own destinies again.

It was also the case that central funds were readily available to purchase new, expensive library systems which librarians were only too eager to obtain. Little control was exerted on the spending of these central funds. Librarians were free to purchase whatever systems they chose.

At that time I was involved with the SCOLCAP cooperative system, which some of you will remember. My team and I had very thoroughly whetted the appetites of many Scottish librarians for automated systems and when we were late delivering on our promises, many SCOLCAP librarians were understandably very anxious to keep moving forward and with money burning a hole in their pockets they were very easy targets for the swarming commercial systems suppliers. As a result, there was a very rapid take up of commercial library systems in Scotland in the early and mid 1980s.

For many, the joys of ownership very quickly became tarnished when they discovered the limitations of their systems and when they found that dealing with a hard-nosed commercial supplier was very different from dealing with their very amenable, non-commercial, cooperative team. Suddenly everything had a price! They also discovered it was uncomfortable to have the buck, once more, stopping on their desks. Not having a central team to blame when things went wrong was a factor many overlooked when they left the security of the cooperative system. Progress is often closely linked with pain and much pain was felt at that time.

The mid to late 1980s in Scottish libraries was a frantic time when the main criteria for choosing a new library system seemed to be that it had to be a system no-one else in Scotland was using. It was also a time when all the good, time- consuming work done over the previous decade or so to ensure we were all using identical bibliographical standards, was thrown to the four winds. Many of those early commercial systems used features that were incompatible with all other systems. They tended to create records geared to the circulation (issue control) functions of the library house-keeping process. Puritanical chief cataloguers and idealistic chief librarians who would not countenance any deviation whatsoever from pure, national standards when they were part of a cooperative, suddenly were prepared to accept just about anything on their own systems. Such were the insidious attractions of owning one's own automated library system.

The bibliographic legacy of that period, in the form of sub-standard records we have neither the time nor the money to upgrade, will live with us for many years even though, now, most commercial systems place considerable emphasis on an adherence to standards. However, in the 1990s, Scotland has, once again, entered into a collaborative phase but with the realisation that it is faced with considerable compatibility problems on both systems and record fronts. Nevertheless, it is with considerable vigour that these problems are being tackled and it is this work I would like to discuss now.

Networking Initiatives in Scotland

When the dust settled and Scottish librarians became sufficiently confident to voice their concerns about the limitations of their systems, the feature that emerged as the number one worry was the inability of their systems easily, if at all, to share information or data with their colleagues in other libraries. The system suppliers could not or would not easily resolve this predicament because formats were so diverse.

The problem of being able, directly, to share bibliographic data has still not properly been resolved except, of course, through the use of utilities such as OCLC and the emerging Confederation of European Research Libraries (CERL), which is working towards the creation of a European bibliographic database, initially of early material. Interlibrary bibliographic record transfer, promised, many will remember, in 1986 by advocates of OSI at this symposium, indeed, in this very room, is still not readily available, although BS ISO 10163-1 1993, Part 1:Protocol Specification for the OSI Search and Retrieve Application Protocol Specification was issued at the end of August 1993 so, very slowly, we are getting there.

JANET, the Joint Academic Network, and, more recently, the Internet have provided opportunities to access other libraries' catalogues and a project in Scotland called SALBIN, the Scottish Academic Libraries Bibliographic Network, developed PC-based software to facilitate access to remote catalogues. The software provided a simple menu of the academic libraries in Scotland and when a user chose a particular library from the menu, the software went off and established the appropriate connection. The system worked reasonably well but relied heavily on local tailoring whenever an address changed or a new library was added. Since this tailoring was rarely done on time, if at all, SALBIN created considerable irritation among users, particularly when the range of addresses increased to include all academic research institutions in the UK. Though valiant attempts have been made to keep it up to date, it has largely been overtaken by the many CWIS (Campus Wide Information Service) systems that have been developed. As we all know, one facility on these CWIS is a similar menu system allowing easy access to remote catalogues and other services. The SALBIN software is now in the public domain and is available to all.

The same Group which developed the SALBIN software is now engaged in the development of a Scottish Academic Libraries Serials Database (SALSER).[1] The activities of the central, technical, SALSER team are monitored by the SALSER Steering Committee. This system is not without its critics who feel that regional serials databases would be more relevant to the needs of the Scottish community. Nevertheless, I am pleased to say, a single, national database has won the day. The National Library of Scotland will be contributing some 20,000 high quality serials records from its own online database into this service which will be based at Edinburgh University. In addition, the British Library's very much larger serials database, but consisting of much lower quality records, will be a key element in the development of the system. The idea is to provide a brief serial entry together with a list of library locations. Users then have to dial into a selected library to identify precise holdings. Unfortunately, at present, very few Scottish libraries have their serials holdings information available online.

At this stage it is appropriate to tell you something about the committee structures we have set up in Scotland to oversee and coordinate resource sharing. The Scottish Confederation of University and Research Libraries (SCURL) was formed in early 1993. SCURL is a working group reporting to the Board of Trustees of the National Library of Scotland. Before it was called SCURL, the Group was called the Working Group on Library Cooperation. When new universities were formed in 1992/3 from upgraded colleges and polytechnics is was deemed to be a good time to review the constitution, the remit and even the name of WGLC. SCURL was the result. It has a very wide, indeed, not yet fully defined remit and a wider membership than the old WGLC.

Reporting to SCURL is the Standing Committee on Library Automation Requirements (SCOLAR), previously SCHoLAR, together with its technical sub-committee and the Conspectus Steering Group together with its sub-committees working in the areas of Official Publications, German Studies and the Visual Arts.

SCOLAR is actively engaged in identifying a checklist of functions[2] to which all new automated systems *acquired by Scottish academic libraries should* conform. This comprehensive checklist, which will make the toes of most commercial suppliers of systems curl up, has just been published. In addition, its contents will be made available through BUBL, the Bulletin Board for Libraries, the internationally recognised electronic mailing list and acclaimed source of IT information. BUBL has recently moved to the University of Bath from its home in Scotland where it has been based for the last two or three years and has been revamped for GOPHER use.

SCOLAR has also produced a List of Existing Systems and a Timetable for Procurement for the Scottish academic community. It is recognised by many that present automated library systems will have to be replaced if we are to take advantage of the new facilities currently or soon to be made available. The desire of Scottish librarians, when they choose their next systems, is that earlier mistakes will not be repeated. We hope to be able to make choices which will be compatible each with the other and we are hoping to influence and encourage suppliers along that road. It is a strongly held view by some influential librarians in Scotland that, the next time around, a library should be able to take the cataloguing module from one supplier, the circulation module from another and the OPAC from yet another supplier. All the software would be core UNIX compatible and would be capable of being used on any one of the major UNIX platforms. If we can achieve this goal, we will have achieved software and hardware independence: a very ambitious goal but not a bad one to aim for!

Networking Initiatives by the NLS

Less than a year ago I know of one librarian in the UK who gave lectures all over the world on the wired campus. The system he was introducing into his library/university was at the cutting edge of technology. Staff and students would enjoy a full 10 megabits/sec bandwidth over the campus through a coax-based LAN. He has almost completed the installation now. Imagine his frustration when he discovered that in the few months since he started his installation, intelligent cabling systems have been developed which now allow 100 megabits/second over unshielded twisted pair wiring (UTP) and with yet higher throughput promised in the near future and that the system he has almost finished installing cannot be upgraded to run at these speeds.

At the NLS we have an opportunity to introduce a brand new structured wiring system into our main building. Our present system is only about seven years old but it was introduced in the days when the main device used to connect to a computer system was a terminal. We now need something that will allow us to connect PCs directly onto the system as clients and which will accommodate expected needs to transfer large numbers of images across the system. We have opted for an AT&T category 5 system running on UTP which will operate at speeds up to 100 mbs and which will be guaranteed for fifteen years. We expect an even faster system to be available next year but we calculate that we are most unlikely to need a system running faster than 100 mbs within the next 15 years, so we are happy, in this case, for the technology to pass us by, unlike my colleague mentioned above. We are laying the foundation for the time when we will need to distribute our information in the form of images to other libraries throughout the world and, of course, to users actually within the walls of the NLS.

CONSPECTUS

CONSPECTUS though initially developed in the USA by the Research Libraries Group (RLG) it has been enthusiastically taken up in Scotland. For those who have not yet come across the system, it is a database which records the collection strengths and weaknesses of a library. Each library assesses its own strengths and weaknesses and contributes the information using standard forms and codes into a common, Conspectus database which is then distributed on a large number of floppy discs to all the other contributors. The NLS has been a prime mover in encouraging the establishment of the technique and, at present, there are eleven users of the system in Scotland, including all the older universities and two major city reference libraries. The four, recently created universities in Scotland are presently being encouraged to join in.

Currently all 7,000 subject areas in all participating libraries have been coded and entered into the database using a six level indicator where "0" means "no holdings" and "5" means "comprehensive coverage". From this initial survey, which dates back to 1987, separate, very useful extracts have been created.[3] For example, a "Directory of official publications in Scotland"[4] has been published containing the results of the Conspectus survey of government documents, covering official publications held in Scottish libraries but expressed in textual terms rather than in Conspectus codes. Another example of Conspectus being put to a practical use is in the creation of a guide to German information resources in Scottish research libraries, which is soon to be published, as will also be a guide to information sources on the fine arts in Scotland.

Following the creation of the Conspectus database, each library was invited to make a commitment to continue collecting at its current rate in those areas where it had indicated particular strengths, ie where a current collecting intensity (CCI) of 4 or 5 had been indicated.[7] The library was not expected to spend more money on the designated subject area but only to commit in the future to spend at the same current level and to let the Conspectus Coordinating Committee know if and when it was unable to continue with the undertaking. The initial pass of this request has been made and a second level pass is about to start which hopefully will pick up and reallocate those subject areas rejected by the first choice library. The system is entirely voluntary and only works with the full cooperation of the participants.

It also has to be said that the assessment of a particular library's different subject strengths and weaknesses is purely subjective and relies solely on internal decisions made by an individual library. So far there has been no external assessment to verify that different libraries are using the same standards when forming opinions of strengths and weaknesses.

The use that can be made of Conspectus is also being considered in relation to the allocation of preservation responsibilities. Preservation is such a massively expensive issue that it can only adequately be tackled through cooperative endeavour. Conspectus provides a possible tool to help in this work, though again, issues of accessibility and quality of material held depends very much on the judgement of a local Conspector.[8]

Like all good tools, Conspectus can be a double edged sword and the data it reveals must be used with considerable discretion. For example, some of the data has to be guarded very carefully especially nowadays when governments are looking for any excuse to close down small, perhaps under-utilized departments in our universities. The weaknesses of a library's holdings in a particular subject area can be a strong indicator of the weakness of the department being served, especially if immediate and direct comparisons can be made with the strength of holdings in identical subject areas in other universities.

Preservation of Newspapers

The rapid disintegration of newspaper collections is not a problem restricted to Scottish libraries. For some years now we have been attempting to secure sufficient funds to allow us to preserve our collections using a microfilming process. The idea has been to create a central newspaper microfilming unit in the National Library of Scotland which libraries throughout Scotland can utilize to preserve their local newspaper holdings. In addition to the newspapers held by the NLS, where these are deficient or are too far decayed we are relying heavily on the assistance of the BL Newspaper Library in London, whose holdings of Scottish newspapers are extensive. The money needed to fund the operation is considerable and it has taken us a long time to secure. I am happy to report that this work is now well and truly underway thanks to very generous funding by the Andrew W. Mellon Foundation over a three year period and considerable operational assistance from the Scottish Libraries Information Council (SLIC). Last year 468 reels containing 230,000 frames were dispatched to the central store for UK preservation of microfilm masters. It is expected that the unit will be able to operate as a cost recovering unit at the end of the three year Mellon funding period.

Microfilming is but a first step in providing ready access to the information held in newspapers and some work has already been done on the conversion of this microfilm-based information into digital images which can be used to distribute pages of information to remote locations. However, much more work is needed before we can offer this particular service. However, the prospects look good for the future. The conversion of microfilm into digital form, though relatively expensive, is fast and accurate. Indexing the information will present the far greater challenge to librarians.

Directory of Library Information

The creation of a directory of Scottish library information has undergone at least two transitions. When it was first conceived it was expected that the information would be held and distributed through the online system operated by the NLS. Then it grew into a much larger concept involving the use of X.500 Directory system and two unsuccessful attempts were made to secure funding through the European Libraries Plan initiative. However, having wasted far too much valuable time preparing proposals for ELP, as many of us here will have done, it is now back to the drawing board to identify a way of developing it without outside help or interference. Initial ideas favour linking this data with that held for the SALSER system discussed earlier.

Summary of IT Resource Sharing in Scotland

In Scotland we are aware of mistakes made in the past and recognise that no library is able to stand aloof from other libraries if it is to provide an adequate service to its readership. We also recognise that, where possible, librarians like to be able to make their own decisions and need to look after the best interests of their own libraries. The cooperation currently in place between Scottish libraries is expected to redress some of the mistakes made in the past and to secure a more open, cooperative future.

Image Compression Standards

There are a number of image compression standards in use today but I would like to discuss, briefly, two standards - the JPEG standard and the FIFF standard. However, before looking at the two standards, let me remind you of the two problems that compression techniques attempt to minimise. I refer, of course, to the storage problem and to the transmission problem. Storage is a reducing problem as the technology provides us with ever greater storage capacities at smaller and smaller cost. Nevertheless, without compression, we can easily create images of a megabyte or more for each page of text or picture. We all have heard about DPI and pixels and resolution but what do these mean in practical terms? If we scan an object at 100 dpi, for every inch along one particular line cut through that object we take 100 samples of it which we record in 100 different pixels. An object one inch square will therefore require 100 x 100 pixels, 10,000 pixels, to record that object. If the object is black text on a white page or is a simple line drawing, we can record the information contained in the pixel in one bit of information. The bit is either off or on to represent black or white space. As soon as we wish to record grey scale, the pixel needs to record more information. An 8 bit pixel can record 256 different grey scales but our file size for our image increases by 8 times. If we wish to record colour we might wish to use a single 8 bit byte of information for each of the three primary colours. In this case our file size increases by 24 times. So, the size of an image file can be calculated as follows:

file size = dpi x dpi x pixel size x height x length.[7]

Thus, file sizes in bytes of an A4 page captured at various resolutions and pixel sizes are:

100 dpi at 1 bit = 112 Kb
300 dpi at 1 bit = 1 Mb

100 dpi at 8 bits = 900 Kb
300 dpi at 8 bits = 8 Mb

100 dpi at 24 bits = 2.7 Mb
300 dpi at 24 bits = 24.3 Mb

I am being very conservative when I suggest that three average sized books would require a gigabyte of storage to hold them. One thousand gigabytes is a terabyte. So 300,000 books would require 100 terabytes of storage. Also, at 9,600 baud, one image of a megabyte would take a minimum of 17 minutes to be received; not a very satisfactory response time. Even at higher transmission speeds, which, of course, cost much more to use and are not always available in a wide area network operation, speeds have to increase considerably before response times become acceptable. Use of the right compression system is vital if we are to make economic use of images. And so we come to the two standards under consideration in this paper.

The Joint Photographic Expert Group (JPEG) Standard

JPEG uses the Two Dimensional Cosine Transform (TDCT) together with the removal of components that the human eye cannot see to achieve its compression.[8] Being a photographic standard it is specifically designed for the compression of pictures involving continuous tones and compression ratios of between 25:1 and 100:1 can be achieved. Alternative techniques such as run length coding, a statistical technique, can be used in conjunction with JPEG to deal with textual information. It is a standard that has caught on in USA where it has achieved wide acceptability. If we could reduce our storage requirements by a factor of 50 and if we could transmit all our data 50 times faster than we could before compression, most of us would be very happy, I suspect. Unfortunately, my happiness, at least, would be short-lived. If you have a small or a demonstration collection to use and manipulate, JPEG is fine. It gives good results and compression ratios of 50:1 or so sound good. However, what does this mean, in practice? If you have a collection of 30 million images, and remember, just 100,000 books of average length and size would be represented by 30 million images, and if each image is a high quality image, specially created that way because we only want to collect the image once and we decide to do it as well as possible the first time, each uncompressed image might be one megabyte in size. A 50:1 compression would reduce our storage requirement from 30 terabytes down to 600 gigabytes and the transmission time of one compressed image over a 9,600 baud line would take 20.8 seconds. It suddenly doesn't look so sparkling, does it?

JPEG is a hastily introduced standard which has been established mainly by suppliers because they know we buyers of their systems will not do so until we can satisfy ourselves that a standard is in place which will allow us to exchange data with other organisations. Though JPEG will do what is claimed, it is not very efficient by comparison with other systems. We can and must do much better if our systems are to be a success.

Fractal Image File Format (FIFF)

Though hardly heard of in USA, even though it is being developed in the USA at Georgia Institute of Technology, FIFF systems are in use in a number of places in the UK. We even have a company of solicitor estate agents in Edinburgh using the system to hold and compress colour photographs of the properties they have for sale. Any of you who has at one time or another created a computer graphic of a box or a triangle will know that the object is encoded in the form of sets of numbers which represent the position of points or line segments. More advanced systems use three and four dimensions to represent solid objects with different colours. If we want to use a graphic, we don't have to create it, we go to a library of graphic shapes and colours and we select the one we want. Going one step further, we sometimes need far more shapes than can be found in a traditional software library. These shapes might represent clouds or the bark pattern on a tree stump. Such patterns are available and have been known about for almost 100 years. Mathematicians at the turn of this century played with formulae which represented strange repeating patterns and which could be used to create shapes and patterns found in nature. Benoit Mandelbrot, of IBM's research laboratories, coined the term fractal to describe objects which are very "fractured" in shape. Indeed, most of nature is "fractured". Perfect circles, squares and other well known geometrical shapes are rarely found in nature. The vast majority of shapes we encounter are highly discontinuous. Using fractals to simulate landscapes and other natural shapes is not new. What is new is our ability to start with an actual image and then find the fractal or the group of fractals which can represent that image to any degree of accuracy we care to define.[9] Since the technique includes a compact way of representing these fractals, we end up with a highly compressed set of data representing that image. Compression ratios of 10,000:1 have been achieved through the use of fractals and it is commonplace to achieve compression ratios in excess of 500:1. So how do they work, you ask?

An image to be compressed first has general image processing techniques, such as colour separation, edge detection, spectrum analysis and texture variation, applied to it. This allows us to break the image up into segments. (You might be interested to know that it is these same techniques that are used to add colour to old black and white motion pictures.) We next look up these fractals in a library of fractals which, though it does not contain literal fractals, it does contain compact sets of numbers called iterated function system (IFS) codes that will reproduce the corresponding fractals. There is a mathematical result known as the Collage Theorem which always guarantees that we can find a suitable IFS code and also gives a method for doing so. Once we have the codes of all the segments in our image we can discard the digitised image and simply keep the IFS codes.

IFS theory is an extension of classical geometry and uses affine transformations, which describe rotations, scalings and translations, to express relationships between the different parts of an image. With IFS theory, a cloud or the bark of a tree can be defined and described as accurately as an architect can describe a house.

Fractal compression is a system which is progressive, that is, it gradually builds up the image to any degree of accuracy the receiver wants. This is helpful in that we can quickly send simple versions of many possible images initially and only when the end-user decides he or she wants to see a selected page in detail need we send the full image. Though, like JPEG, it is a lossy system, losses can be minimal. It was long written off as just another experimental system but now it has definitely emerged from the research laboratories and is doing practical work on a daily basis. It uses hardware compression but software decompression so anyone can load the decompression algorithms which makes it economical to use. It is acceptably fast in operation and can provide huge compression ratios.

Using fractals, the 30 terabytes storage needed to hold the images of 100,000 books reduces to 60 gigabytes, on average, and transmission of any one image at 9,600 baud reduces from 17.4 minutes to about 2.1 seconds.

Conclusion

Fractal compression is a system worthy of much greater investigation and use but is in danger of being overwhelmed by the JPEG steam-roller. Compression systems with efficiencies comparable with or greater than that provided by fractal compression are vitally needed if we are to manage the large quantities of data we are bound to generate in the image era. We cannot afford to accept less.

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The Consortium of Academic Libraries in Manchester (CALIM) : Strategic and Development Planning of a New Consortium

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Abstract

This paper will outline the planning involved in setting up a consortium involving the five academic libraries in Manchester (UK) and analyse the progress since early 1992. The strategic plans for Years 1 and 2, together with the first Annual Report, will be presented and discussed, focussing on the lessons learned. The activities to date of the working groups within the consortium will be reviewed, and this will be placed in the context of the development plan for the next two to three years. Within CALIM, great emphasis is placed on the annual strategic plan with policy being vigorously reviewed on a regular basis. A consortium is an organic system, changing and evolving constantly, and this should be reflected in the strategy and agreed governing principles.

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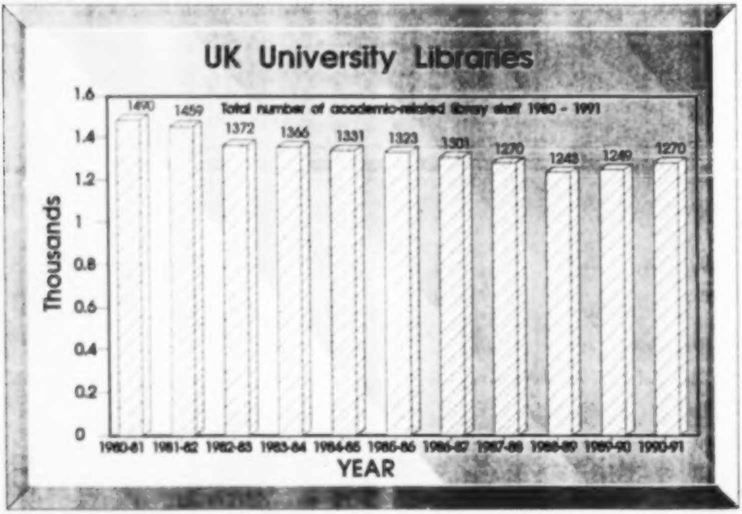
Greater Manchester benefits from one of the largest concentrations of autonomous and quasi-autonomous institutions of higher education in the UK outside London. Furthermore, these institutions are close together geographically: within two square miles of each other. This group of institutions serves a user population of approximately 45,000, and represents a substantial proportion of the national research effort.

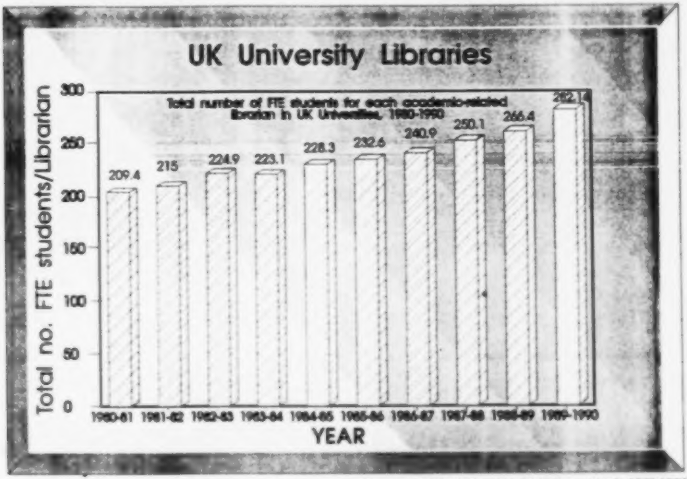
The combined resources of the five libraries that serve the institutions are very significant in national terms, comprising over 5 million volumes, 350 staff, and a total annual budget of around £10 million. These statistics represent a large resource investment for the UK.

However, statistics, no matter how superficially comforting, provide no protection against the financial constraints and resource pressures currently being experienced by UK academic libraries. The total number of academic staff employed in libraries is diminishing **(Figure 1)**, whilst at the same time the number of FTE students is increasing **(Figure 2)**. Total expenditure as a percentage of university recurrent income has also declined **(Figure 3)**.



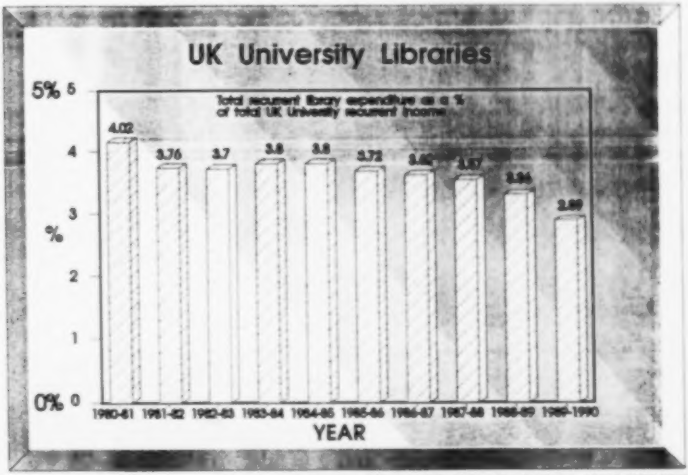
Source: UFC University Statistics, Vol 3 1980-1990

Figure 1



Source: UFC University Statistics, Vol 3 1980-1990

Figure 2



Source: UFC University Statistics, Vol 3 1980-1990

Figure 3

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These realities are forcing us to focus strongly on maximising our resources through: cost-benefit analysis; marketing initiatives; collection rationalisation; charging policies; and priority budgeting. All these 'lean-burn' management practices have taken over from collection building; expansion; self-dependence; and protected funding as the main pre-occupations of academic libraries.

However, at the same time, technological progress is creating a massive increase in awareness by providing access to indexes, databases and OPACs that simply did not exist a few years ago.

Consequently, the combination of static or shrinking resources and the ever-increasing information awareness of the user has created a library environment in which the possibilities offered by careful co-operation are very attractive, and indeed, vital to survival.

As a result of the above situation, CALIM was created in August 1992 to provide a framework for sensible resource management.

CALIM consists of five libraries:

- John Rylands University Library of Manchester (JRULM)
- Manchester Metropolitan University (MMU) Library
- University of Salford Library
- UMIST (University of Manchester, Institute of Science and Technology) Library
- Manchester Business School Library;

and is governed by a Council consisting of the Directors of the five libraries. My role as Secretary incorporates strategic planning, administration and the implementation of resolutions.

During the early part of 1992, there were two clear priorities:

- What do we want to do?
- How do we aim to do it?

In other words, we needed a strategic plan for the first year of operation. It seemed to me that there should be four major elements to this strategic plan:

- A clear MISSION STATEMENT;
- An identification of the CRITICAL SUCCESS FACTORS;
- A detailed set of AIMS AND OBJECTIVES;
- A set of GOVERNING PRINCIPLES to police the consortium.

These four elements provided the framework of the plan which was written over the summer of 1992. We wanted the strategic plan to be concerned solely with the Art of the Possible, and so the CALIM plan was restricted to a one year time horizon, and would be completely revised the following year, in the light of experience.

After consultation and revision, a general mission statement was framed for Year One.

"The co-ordination of the personnel, physical and electronic resources of the constituent libraries for the purpose of enhancing and developing the range of services offered to the staff and students of Manchester institutions, within the constraints imposed by the autonomous nature of the participating libraries and the service responsibility to their individual institutions. To support this role CALIM is committed to excellence at all levels of staffing through co-operative training, joint research projects, and the fostering of initiative and innovation."

I don't think that anyone could argue with the message of this Mission Statement for an academic library consortium, but identifying what we might regard as the critical success factors (the second element of the strategic plan) is much more complex and depends to a large extent on local conditions. Identifying critical success factors can be difficult, and may vary from year to year, and our experience indicates that they MUST be revised on an annual basis.

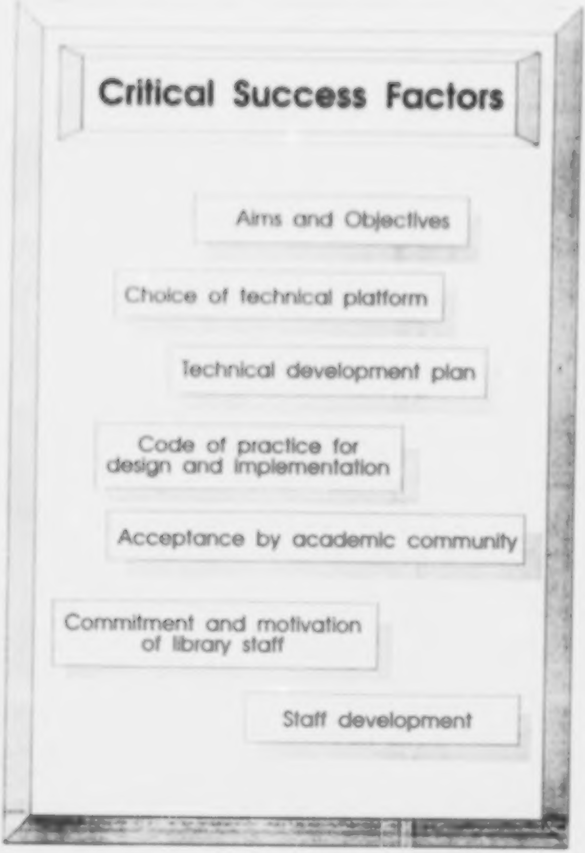
Critical Success Factors
Aims and Objectives
Choice of technical platform
Technical development plan
Code of practice for design and implementation
Acceptance by academic community
Commitment and motivation of library staff
Staff development

Figure 4

Figure 4 lists the initial critical success factors for CALIM. First and foremost of these were the aims and objectives. Without these agreed, no progress could be made; and a lot of time and effort was devoted to formulating them. Necessarily, they represent a consensus of opinion; goals acceptable fully to all members of the consortium.

CALIM AIMS AND OBJECTIVES

TO ENCOURAGE RESOURCE SHARING IN THE SPIRIT OF ENLIGHTENED SELF-INTEREST

TO DEVELOP AN INFRASTRUCTURE INCLUDING COMPUTER NETWORKING, COMMON CATALOGUES AND SYSTEMS OF DOCUMENT DELIVERY ENABLING COST-EFFECTIVE CO-OPERATION.

TO REGULATE ACCESS ON THE BASIS OF FORMAL AGREEMENT WHEREBY DEFINED MEMBERS OF ONE INSTITUTION CAN USE THE LIBRARY OF ANOTHER.

IN THE LIGHT OF SUCH AGREEMENTS, TO AGREE POLICIES OF COLLECTION DEVELOPMENT PREVENTING UNNECESSARY DUPLICATION AND ENSURING THE PRESENCE OF VITAL MATERIALS IN MANCHESTER.

TO ENCOURAGE AND SEEK FUNDING FOR RESEARCH PROJECTS OF COMMON INTEREST.

OTHERWISE TO IDENTIFY AND IMPLEMENT INFORMATION POLICIES WHICH ASSIST THE STUDENTS AND STAFF OF [illegible] MANCHESTER INSTITUTIONS.

Figure 5

The third element of the strategic plan,**(Figure 5)**, the Aims and Objectives, embrace the practical aspirations of CALIM. They are quite clear and concise, and firmly focussed on the specific needs of Manchester. Again, they are fairly predictable, but this doesn't matter. At this stage we certainly didn't want a set of complex grandiose and over-ambitious goals that would have left the strategic plan with no space in which to grow and evolve.

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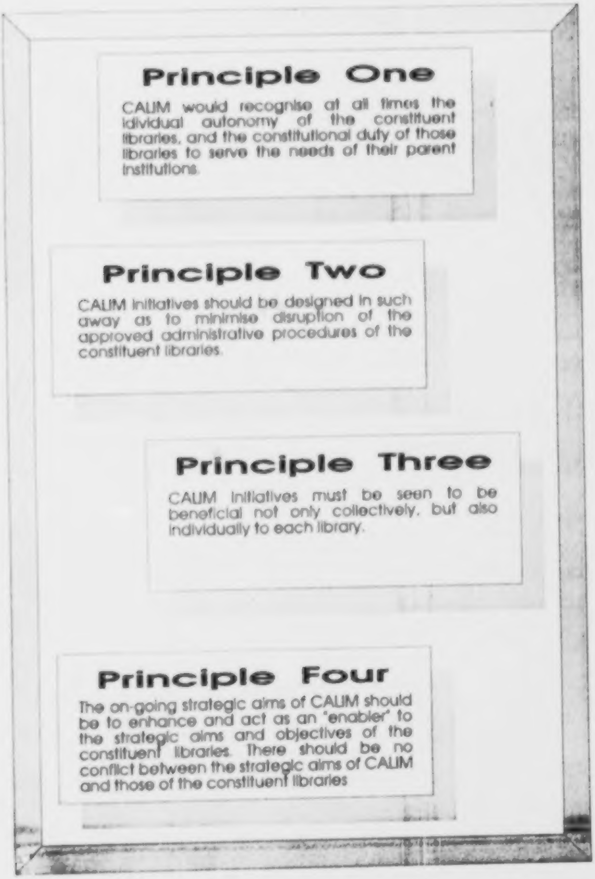


Principle One

CALIM would recognise at all times the idividual autonomy of the constituent libraries, and the constitutional duty of those libraries to serve the needs of their parent institutions.

Principle Two

CALIM initiatives should be designed in such away as to minimise disruption of the approved administrative procedures of the constituent libraries.

Principle Three

CALIM initiatives must be seen to be beneficial not only collectively, but also individually to each library.

Principle Four

The on-going strategic aims of CALIM should be to enhance and act as an 'enabler' to the strategic aims and objectives of the constituent libraries. There should be no conflict between the strategic aims of CALIM and those of the constituent libraries

Figure 6

Where as the Aims and Objectives represent CALIM's practical aspirations in a broad sense; the final element of the strategic plan, the Governing Principles, represent CALIM's co-operative aspirations, which are very important when dealing with a consortium **(Figure 6).** These principles are designed to police the work of the consortium, and we intend to revise them on an annual basis.

So, the structure of the strategic plan for year one looked something like **figure 7**.

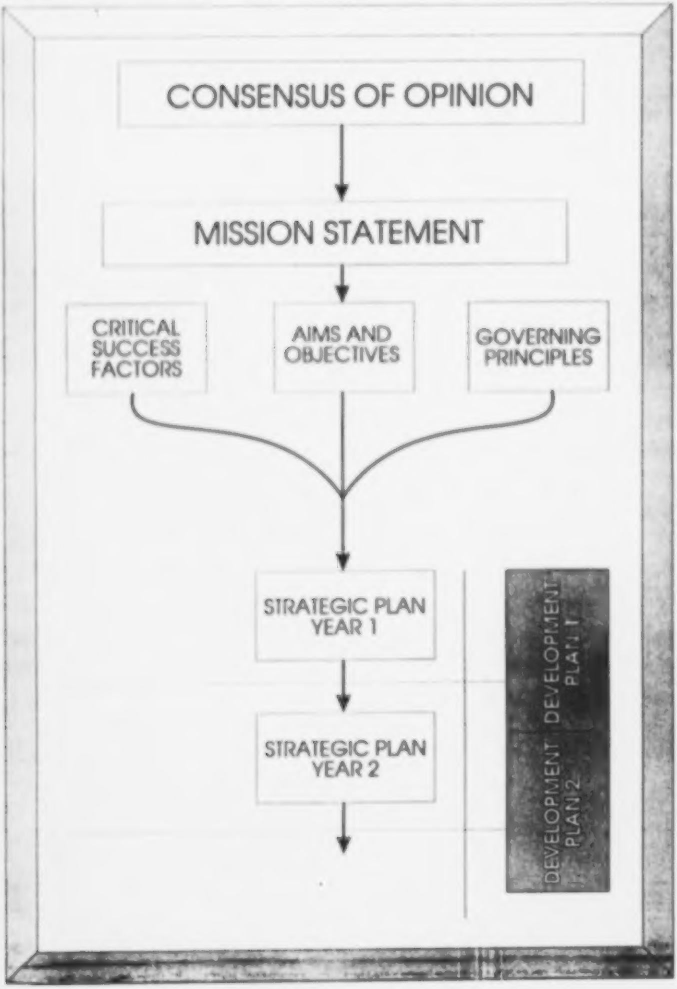


Figure 7

The Critical Success Factors were analysed to identify topics suitable for the first year's work. It was clear from this analysis that we had to concentrate on building an infrastructure, which would then allow us to create the service. The outcome was the decision to set up a series of Working Parties to tackle the targeted topics, and comprised:

- Access and Borrowing Arrangements
- CD-ROM and Internetworking
- Staff Training and Development
- Interlending
- Union List of Serials.

Each working party was provided with an initial remit and consisted of a member of staff from each of the five libraries to emphasise equal co-operation. These working parties were required to report at the end of the academic year, the combined reports resulting in Development Plan 1.

Because the topics tackled by the working parties were so varied, it was important to introduce a measure of quality control into the reporting procedure. **Figure 8** summarises our approach to this problem. The topics outlined in the original remits were subjected to the so-called "BOLD" analysis to weed out irrelevant or non-productive tasks, and add others. Each working party met between four and five times during the course of the year, and at all times the four key concepts of innovation, flexibility, performance and cost-effectiveness were borne in mind by the members of the working parties.

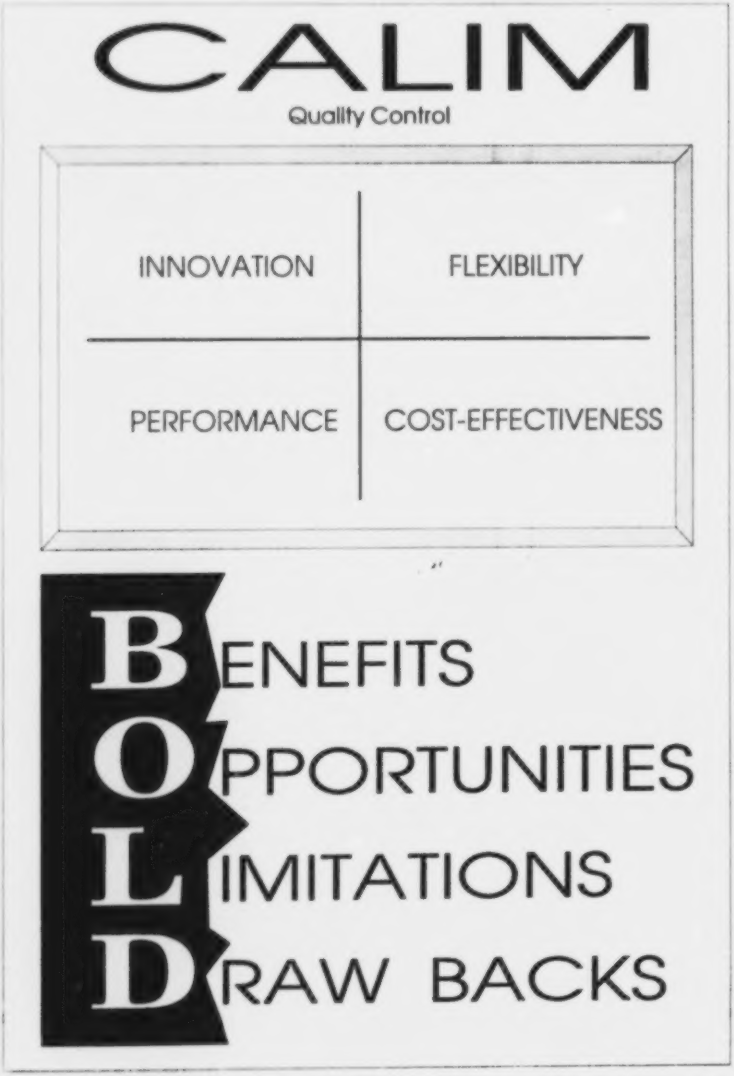

CALIM
Quality Control
INNOVATION
FLEXIBILITY
PERFORMANCE
COST-EFFECTIVENESS
BENEFITS
OPPORTUNITIES
LIMITATIONS
DRAW BACKS

Figure 8

Achievements at the End of Year One

Access & Borrowing:

We now have agreed regulations governing Access and Borrowing throughout the five libraries, which came into operation in September.

Interlending:

Most of the year's work was involved in finding out how many ILL requests generated over an eight week period by the five libraries earmarked for the BL could theoretically have been satisfied within the five library collections. The mean satisfaction rate was 22%, with a high of 32% for requests originating from MMU to over 10% for requests originating from JRULM. A massive amount of data was generated - we will look at this this year in more detail.

CD-ROM and Internetworking:

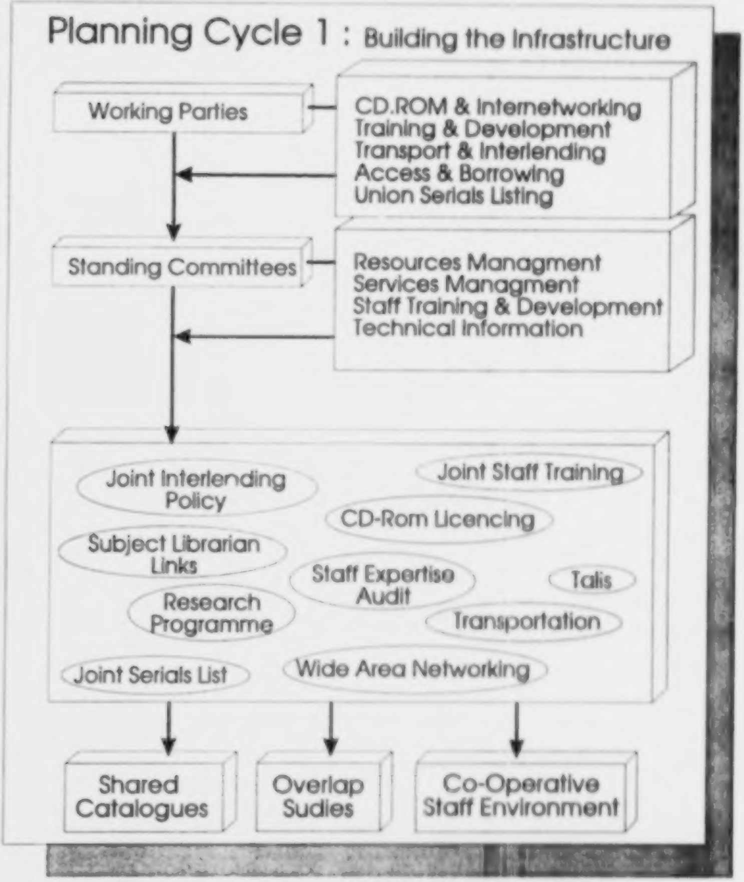
As a result of the work last year we have a union list of over 80 CD-ROM titles with overlap analysis. The main task for this year will be to set up a negotiating framework for separate discussions with the main CD-ROM vendors for networking licences across the consortium.

Training and Development:

Undertook a major survey asking all levels of staff what they would like to see with regard to training and job development; what topics they would like to be addressed. Based on the responses we constructed a list of topics in descending order of popularity and as a result organised the first CALIM Seminar on "Working with People", run by the staff of the Centre for Business Psychology at UMIST, for 64 staff, over three days, for a cost of about £22 per head including lunch.

The overall result of the first year's work was the refinement of Development Plan 1, wich consits of two planning cycles as mentioned above: building the infrastructure, as we see here, and then creating the service **(Figure 9)**.

CALIM DEVELOPMENT PLAN



Timescale: January 1992 -1 January 1996.

Planning Cycle 2:Creating the Service

Figure 9

Year 2 has seen the creation of four Standing Committees to underpin the work of the first year:

- Staff Training and Development;
- Technical Infrastructure;
- Resources Management;
- Services Management.

Creating the service is a glimpse at how we currently view the future **(Figure 10).**

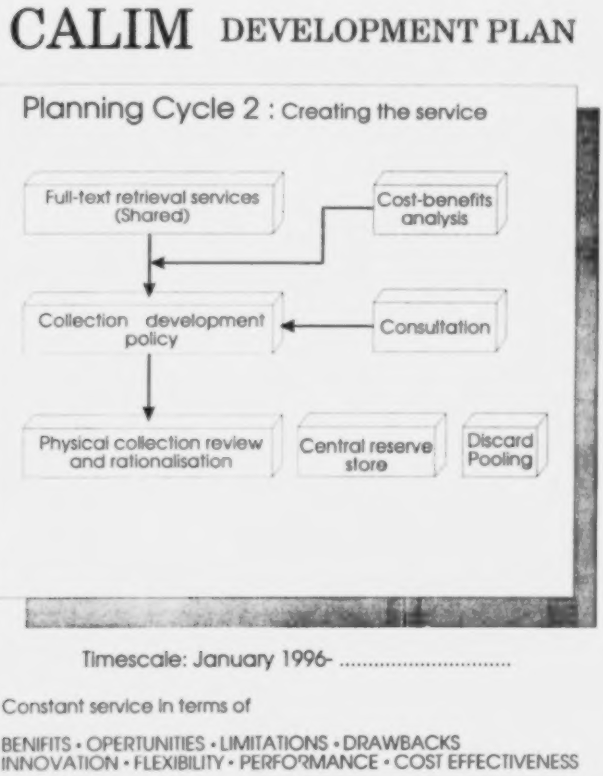

CALIM DEVELOPMENT PLAN
Planning Cycle 2 : Creating the service
Full-text retrieval services (Shared)
Cost-benefits analysis
Collection development policy
Consultation
Physical collection review and rationalisation
Central reserve store
Discard Pooling
Timescale: January 1996- ....
Constant service in terms of
BENIFITS • OPERTUNITIES • LIMITATIONS • DRAWBACKS
INNOVATION • FLEXIBILITY • PERFORMANCE • COST EFFECTIVENESS

Figure 10

The current management structure of CALIM is shown in **figure 11**. Furthermore, CALIM now has a common technical platform under BLCMP Ltd.

So, to recap, Planning Cycle One indicates our goals up to 1996, by which time we would hope to have shared catalogues and a fully co-operative staff environment. Detailed overlap studies will then be initiated to form the basis of Planning Cycle Two: creating the service. This will involve full-text retrieval; a collection development policy; physical collection rationalisation, and electronic document delivery.

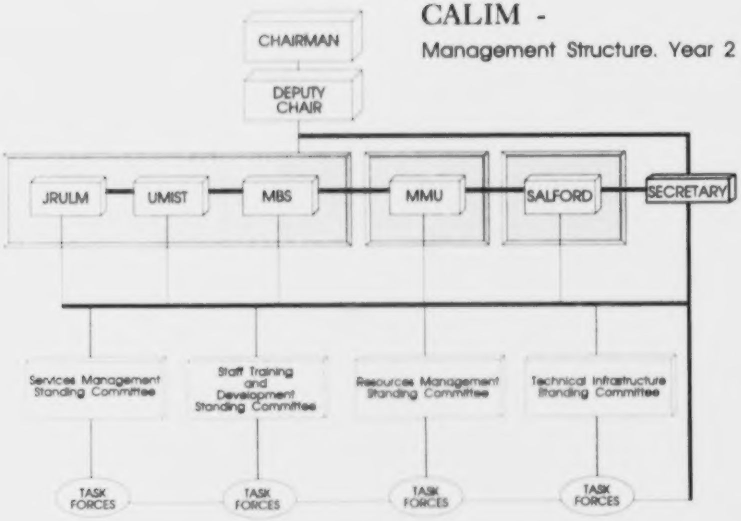
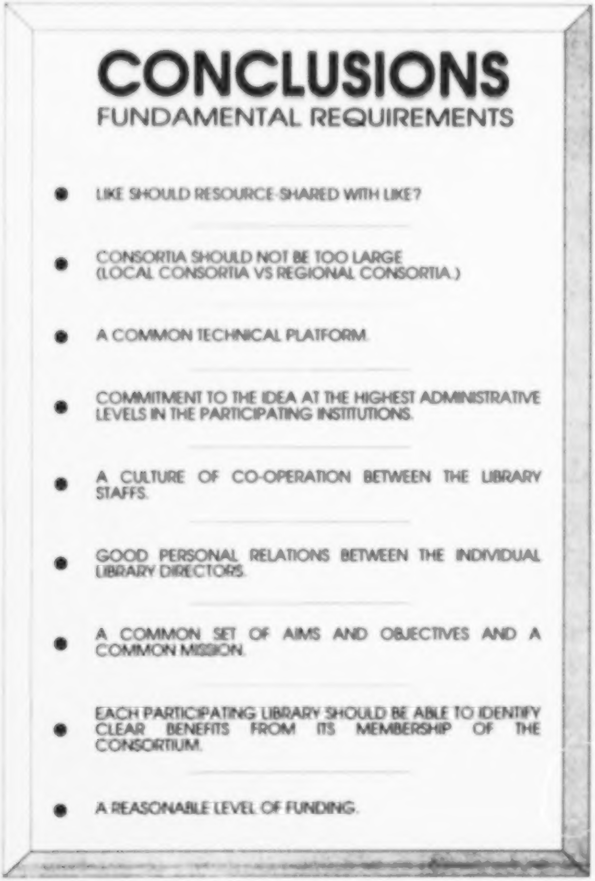

CALIM -
Management Structure. Year 2
CHAIRMAN
DEPUTY CHAIR
JRULM
UMIST
MBS
MMU
SALFORD
SECRETARY
Services Management Standing Committee
Staff Training and Development Standing Committee
Resources Management Standing Committee
Technical Infrastructure Standing Committee
TASK FORCES
TASK FORCES
TASK FORCES
TASK FORCES

Figure 11

I would like to give you some conclusions about resource sharing that are based on our experience at CALIM for the first year. I hasten to add, these are Manchester conclusions. I believe library consortia are delicate plants, very specific to their own environments; consequently generalisations are not merely risky, but can be unsuitable for a different setting.



CONCLUSIONS

FUNDAMENTAL REQUIREMENTS

- LIKE SHOULD RESOURCE-SHARED WITH LIKE?
- CONSORTIA SHOULD NOT BE TOO LARGE (LOCAL CONSORTIA VS REGIONAL CONSORTIA.)
- A COMMON TECHNICAL PLATFORM.
- COMMITMENT TO THE IDEA AT THE HIGHEST ADMINISTRATIVE LEVELS IN THE PARTICIPATING INSTITUTIONS.
- A CULTURE OF CO-OPERATION BETWEEN THE LIBRARY STAFFS.
- GOOD PERSONAL RELATIONS BETWEEN THE INDIVIDUAL LIBRARY DIRECTORS.
- A COMMON SET OF AIMS AND OBJECTIVES AND A COMMON MISSION.
- EACH PARTICIPATING LIBRARY SHOULD BE ABLE TO IDENTIFY CLEAR BENEFITS FROM ITS MEMBERSHIP OF THE CONSORTIUM.
- A REASONABLE LEVEL OF FUNDING.

Figure 12

Information Networking in the Nordic Countries : A Swedish Perspective

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Goran Skogmar got his degree in history and political science from Lund University in 1967 and started his library career at Stockholm University Library in 1973 as a reference librarian. He was in charge of introducing online searching for the Stockholm University in the late 70s and early 80s. This was followed by an increased concern in the automation of Stockholm University Library. He is now head of systems development at the LIBRIS department of the Royal Library.

Abstract

This paper describes library and information networking in the Nordic countries with special emphasis on Sweden. The main focus is on the academic networks and the NORDUNET cooperation. After a short general introduction a section intended as a detailed resource guide follows. The article concludes with an evaluation and discussion of Nordic developments in an international context. The evolution and development plans of the central Nordic bibliographic services are also described and a brief report on the Nordic SR project is included.

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Introduction

The information infrastructure of the Nordic countries is changing rapidly. Driving forces are the revolutionary innovations in telecommunications, computing and electronic media. The main trends can be summarized in a few words: increasing storage, processing and transfer capacity; digitization; miniaturization; standardization; graphic user interfaces; connectivity and internetworking. The proliferation of personal computers and the spread of LAN technology have created a situation where client/server technology, distributed computing and workgroup computing are imminent; these types of applications are now being planned and implemented. Private companies and government agencies are showing a renewed interest in information resources management and business intelligence, and the debate about telecommunicating and the eventual marriage between home electronics and information networking has started again. End user searching of databases is increasing: end users already perform an estimated 80% of all database searches in Sweden.[1] Academic networks have shown a phenomenal growth in use in recent years. Many library services and databases can now be reached via information servers within NORDUNET. There is a high level of investment in public and private telecommunications networks and transmission techniques like Frame Relay and ISDN are already functioning on a small scale.

The aim of this article is to give a library perspective on information networking in the Nordic countries with special emphasis on Sweden. The tacit assumption is that Nordic developments probably reflect general trends. It includes a detailed survey of resources accessible via the academic networks, all the Nordic countries are covered and this section is intended to serve as a practical resource guide. Finally, the Nordic library services and bibliographic utilities, especially LIBRIS, and their development plans are discussed. In this context the Nordic SR project will be described. The article concludes with a discussion and evaluation of current trends and possible future developments.

The Data Communications Infrastructure

Sweden and the other Nordic countries were somewhat slow to introduce dedicated networks for data communication. In the seventies the public telephone networks were used and it was not until around 1980 that circuit- and packet-switched public networks were launched. Before that a semiprivate X.25 network called Scannet had been in operation since 1976.[2] The Swedish X.21 network is called Datex and the name of the X.25 net is Datapak. The latter was introduced as a direct consequence of the need to reach databases available on Tymnet, Telenet and other international nets.

The establishment of the Nordic academic networks closely reflected developments within ARPANET where TCP/IP and routers were introduced in 1983-1984. All Nordic academic networks started their activities on a larger scale in the second half of the eighties. The main aim at that time was to share expensive computer resources and give access to e-mail and file transfer. The NORDUNET cooperation was established in 1986-1989 and a pragmatic strategy was chosen. TCP/IP was implemented as the main protocol instead of X.25 and the planned OSI.

As a consequence of the deregulation of the telecommunications sector there is now a number of privately owned nets operating in Sweden. Swedish Telecom has a competitor called Tele2 and international services like SprintNet, GNS and France Telecom are active. There are also many other private and corporate networks.[3]

In Sweden, Telecom and Tele2 recently introduced public TCP/IP networks under the name of TIPnet and SwipNet respectively, testifying to the growing popularity of the TCP/IP protocol. The introduction of ISDN is also well under way. Public ISDN services were originally scheduled to be introduced in Sweden in the autumn of 1992 but this has been postponed until 1993. ISDN is, however, already in use as leased lines. The same applies to Frame Relay as an upgraded X.25 service.

The Academic Networks

From a library perspective, the most interesting information sector developments are now occurring within the academic networks. There is one network for each country: SUNET (Sweden), DEnet (Denmark), UNINETT (Norway), FUNET (Finland) and ISnet/SURIS (Iceland). There is intense cooperation between them under the name of NORDUNET and about 60,000 computers are connected.[4] The NORDUNET partners maintain a multiprotocol backbone and bridges between the Nordic countries and other parts of the Internet and many other networks. It is the largest IP-network in Europe. The administration of NORDUNET (the physical network) is managed by the academic computing centre, UNI-C, in Denmark, but the work is contracted to the national organizations. The network operations centre is the Royal Institute of Technology (KTH) in Stockholm. X.25 connections are managed by the University Centre for Information Technology (USIT) in Oslo and the technical coordination centre is the Helsinki University Computing Centre. There is a special information server (nic.nordu.net) at KTH in Stockholm where a file archive is maintained. It mainly concerns the operations of NORDUNET but there are also a lot of newsgroups ranging from the Nordic Engineering and Technical Forum to Nordic Humour (!?). KTH also runs the main FTP-server within SUNET (sunic.sunet.se).

Other main file servers and Gopher servers have been set up at UNI-C, the Helsinki University Computing Centre, the University of Turku (Åbo), the Norwegian Technical University in Trondheim, Oslo University and the University of Reykjavik. Gopher, a search and retrieval protocol with a menu manager that allows for very smooth connectivity between sites,[5] is proving especially popular in the Nordic countries.

KTH hosts the European root, or top-level, Gopher (sunic.sunet.se, login: <gopher>). This provides a well- known entry point to European Gophers, and is the focus of current experiments to structure Gophers and other kinds of Internet services in a subject tree. All important Internet services can be reached from KTH which closely monitors new developments and new sites connected. New European Gophers are to be registered at KTH in Stockholm.

KTH also plays a very important part within the Ebone cooperation which tries to promote and coordinate the use of TCP/IP in Europe. KTH is the Ebone network operations centre and it contributes networking expertise to other Internet initiatives, like the experimental GIX (Global Internet Exchange) in Washington.

In the last two years, most academic libraries and many special libraries in the Nordic countries have been connected to the network. Many OPACs and databases can thus be easily reached from abroad. The same is the case with the central bibliographic services LIBRIS (Sweden), UBO, BIBSYS (Norway), ALBA (Denmark) and LINNEA (Finland). A variety of local systems is used in Sweden, ie VTLS, Geac, Libertas and DOBIS/LIBIS. In Denmark many libraries use the Danish RC system where CCL (Common Command Language) is used for searching the OPACs. BIBSYS is used as the local system of the academic libraries in Norway, and the same is the case with the VTLS system in Finland.

SUNET

SUNET consists of several networks: a TCP/IP-network with some 20,000 nodes and a DECnet with approximately 700 computers connected. There are six 2Mbit/s lines interconnecting the local Ethernets at the main universities to the backbone. The network centre is the Royal Institute of Technology (KTH) in Stockholm. All universities and regional university colleges are connected as well as institutes of technology and medicine. The backbone will be upgraded to 34 Mbit/s in 1993-1994.

There is a special information server for SUNET called BASUN (basun.sunet.se, login: <info>) in Umeå which contains general information about SUNET and a directory of IP- and DECnet-connected systems. (The information can also be obtained as text files by anonymous FTP). An experimental X.500 service has recently been implemented as a part of the BASUN service.

Most Swedish universities and university colleges have installed Gopher servers and there are also some experimental WAIS services.[8] The most notable among them is run by the sciences branch of Lund University Library (UB2). Many other WAIS servers and clients are being set up and there are plans to combine the use of the Gopher, WAIS, World Wide Web and eventually Z39.50 protocols to facilitate navigation and retrieval of Internet information resources.

UB2 runs a library service based on Gopher and WAIS servers (munin.ub2.lu.se). It is called the Lund University Electronic Library and the easiest way to reach it is via the KTH Gopher. Among the databases are subsets from the Lund University Library OPAC concerning computer science and environmental studies. Research reports, project information, an archive of electronic conferences and information on the Internet are also mounted for searching under the WAIS protocol. Other WAIS servers can be reached and UB2 runs an interesting experiment, the aim of which is automatic detection, indexing and classification of this kind of Internet resources.

Some important Swedish library and information services that can be reached from the Gopher server at KTH are the following:

Databases

MIC-KIBIC

medline.mic.ki.se (Account needed)

The Medical Information Centre at the Library of Karolinska Institute in Stockholm (MIC-KIBIC). Medline and other health related databases mounted locally. Gateway to the NLM databases.

DAFA Infotorg
data.infotorg.se (TN 3270) (Account needed)

Government registers, legal information and statistics.

Libraries

LIBRIS
192.121.86.3 (TN 3270) (Account needed)

The Swedish union catalogue and national bibliography. Other databases.

Lund University Library
lolita.lu.se (login: <hello telnet.lolita>)

Uppsala University Library
udac1.udac.uu.se (login: at "address: disa", at "kod": 100)

The Library of the Royal Institute of Technology, Stockholm
kthlib.lib.kth.se (login: <tekline>)

The Library of Chalmers Institute of Technology, Gothenburg
cthlib.lib.se (login: <chans>)

The Karolinska Institute Library (Medicine)
kibib.kib.ki.se (login: <library>)

Gothenburg University Library
gunda.ub.gu.se (login: <hello gunda.telnet>)

Stockholm University Library
fog.tele.su.se (login: <sub>)

Umeå University library
libum.umu.se (login: <dial vtam>, user id: <biblio>) (TN 3270)

UNINETT

UNINETT is the Norwegian academic network to which more than 100 institutions are connected. There is a main Gopher server at the Norwegian Technical University in Trondheim (gopher.uninett.no) which gives easy access to Norwegian information services. All universities and university colleges are connected. A large number of them have installed Gophers.

There is a current project called SAMSON, the aim of which is to provide network access to all higher education units in Norway including teachers' and nurses' training colleges, schools of journalism, music schools and so on. A number of government agencies and private companies are also connected to the UNINETT on the condition that they do not use it for commercial purposes.

The backbone has recently been upgraded to high-speed lines ranging from 2Mbit/s to 35 Mbit/s and even more. There are X.500 directory services, user newsletters and information on research projects. An interesting service is the Norwegian Computing Centre for the Humanities in Bergen (nora.hd.uib.no) which makes many text archives available. This is the only Nordic service of its kind.

There are Campus Wide Information Systems at the universities of Oslo, Trondheim, Bergen and Tromsø. The Trondheim Gopher server, especially, covers a lot of interesting services. Many international databases are freely available, eg in the field of biology and biomedicine.

Oslo University and its Centre for Information Technology (USIT) runs an extensive CWIS with a lot of experimental services like information kiosks, distance education, multimedia, news services, 'self-service' student registration and local library services.

There is a special infoserver for UNINETT (aun.uninett.no) which manages network information and also contains a software archive. Similar infoservers have been set up at UNIT/SINTEF in Trondheim (ugle.unit.no) and Bergen (alf.uib.no).

Library Services:

BIBSYS

castor.bibsys.no or pollux.bibsys.no (Account needed but free of charge)

The cooperative bibliographic service of the academic libraries. Union catalogue of most academic and special libraries. Both central and local functions.

BIBSYS can be searched by VT100 (castor.bibsys.no) or TN 3270 (castor.bibsys.no or pollux.bibsys.no). There are two interfaces, one menu-driven and one command-based for experienced users. There is a special terminal server which emulates 3270.

Recently BIBSYS has implemented a special Gopher which makes it possible to search the BIBSYS database via the built-in Gopher search module. This is a unique feature which has become very popular and a lot of users find it simpler than the normal BIBSYS interface. The easiest way to try it is to connect via the KTH Gopher.

BIBSYS also runs another interesting experimental service called GENSERV. In GENSERV a user submits search statements and the results are later sent to his electronic mailbox. No account is needed. (Send mail to genserv@nobibsys.bitnet for information. Enter "info" at the subject prompt).

UBO:BOK:TRIP
kari.uio.no (Account needed)

UBO:BOK:TRIP is managed by the University Library of Oslo. It is a conglomerate of databases running under the TRIP information retrieval system. The main databases are the Norwegian union catalogue and national bibliography. There are also union catalogues of periodicals, an index to Norwegian journal articles, subject bibliographies, special collections and many other databases.

DEnet

DEnet is the Danish academic network. It is a star shaped network with its centre at UNI-C (the central academic computing centre) in Lyngby outside Copenhagen. DEnet connects all academic institutions in Denmark. The line speeds vary from 64Kbit/s to 2 Mbit/s. The participating institutions manage their own Ethernets and UNI-C is in charge of the central Ethernet in Lyngby as well as routers and bridges.

Denmark used to apply a somewhat more restrictive access policy than the other Nordic countries but this has now changed. Gopher servers have been installed at UNI-C and the universities of Aarhus and Roskilde and many other places.

The Automation Office of the Danish Research Libraries (FEK) has arranged a very useful gateway service for libraries. It is called the FIND-MENU and can be reached under the address find.uni-c.dk (account needed). It comprises all major Danish academic libraries and gives access to Nordic library services as well as a selection of Internet libraries and other databases. At the moment it is also the only way to reach ALBA, the Danish union catalogue.[7]

Library services:

The Royal Library, Copenhagen
rex.bib.dk (login: <esc>, at the "att"-prompt: <rex>, user-id: <kb rex>)

The Danish Technical Library
alis.bib.dk (account needed)

Aalborg University Library
auboline.bib.dk (login: <def>)

The State and University Library of Århus
sol.bib.dk (<esc>, att: <sol>)

Odense University Library
odin.bib.dk (login: <odin>)

Roskilde University Library
rubikon.bib.dk (login: <rubikon>)

Danish Medical and Science Library
cosmos.bib.dk (login: <cosmos>)

FUNET

FUNET interconnects all universities and other institutes of higher education and research in Finland. The capacity of the trunk lines is 2 Mbit/s and the slowest connections are 256 Kbit/s. The lines are leased from the Finnish PTT. Among the protocols used are TCP/IP and DECnet. The transfer technology is Frame Relay, and about 15,000 computers are connected to the network. The international connections are maintained via NORDUNET.

For people outside Finland, one of the most interesting FUNET services is the server funic.funet.fi. It is one of the largest Internet file archives. It contains about 200,000 files and about 10,000 users from Finland and abroad access it daily. According to FUNET transaction logs about 30,000 files, or three gigabits of data, are transferred on the most active days.

FUNET hosts another very useful service, namely an Archie server (archie.funet.fi, login: <archie>) which tracks more than 700 anonymous FTP-sites around the world. In addition to Archie, FUNET provides experimental WAIS and Prospero services.[8]

File archives are maintained at many universities and university colleges. Especially well-known is the PC software archive at the University of Vaasa (garbo.uwasa.fi).

Library services:

FENNICA The Finnish national bibliograpy
hyk.helsinki.fi (At the prompt enter: hello username, clas01 choose terminal 4 for VT100, at "Anna kokoelma" enter "100", at "Anna uusi..." choose / lang 1 for English. The same logon procedure is normally used for all Finnish libraries.)

Helsinki University Library
hyk.helsinki.fi (The same login procedure as above but enter "clas02" instead of "clas01")

Åbo Academy Library
bo.abo.fi

Jyväskylä University Library
jyk.jyu.fi

Joensuu University Library
joyk.joensuu.fi

Tampere University Library
lakka.uta.fi

Vaasa University Library
kustaa.uwasa.fi

Oulu University Library
kirjasto.oulu.fi

Library of the (Swedish) School of Economics
hanna.shh.fi

SURIS/ISnet

Iceland is a small country which is much dependent on international information services.[9] The Internet is heavily used and there is a Gopher server at the University of Reykjavik. It gives access to all important Internet resources locally and worldwide. All institutes of higher education as well as most primary and secondary schools are connected to SURIS/ISnet.

The University Library and the Icelandic National Library in Reykjavik have recently installed the Libertas system to be used as a cooperative system for these libraries and the libraries of the College of Education and the Central Bank of Iceland. The system includes the national bibliography and the union catalogue of periodicals and it is connected to NORDUNET. The address is: saga.rhi.hi.is, username: <bokasafn>.

Library Networking in the Nordic Countries : Background and Current Situation

Nordic Central Bibliographic Services

At a comparatively early stage the Nordic countries introduced systems for shared cataloguing and bibliographic control.[10] The first one was the Swedish LIBRIS system (1972) which serves as the cooperative system of the academic libraries.[11] It is managed by the Royal Library in Stockholm. Bibliotekstjänst BTJ in Lund started its central database BURK for the public libraries in 1974. Since 1982 Bibliotekstjänst also runs a database called Artikelsök, which contains an index to a selection of Swedish newspapers and journals. In all the Nordic countries there is a sharp division line between the academic and the public libraries which has led to the development of parallel bibliographic services. In Sweden there is a permanent debate about cooperation or even integration of the two systems but not much progress has been seen.

In Denmark the SAMKAT/ALBA system was set up in 1978 by the Computing Centre of the Academic Libraries (FEK).[12] The public libraries have their own database (BASIS) which is run by Dansk Biblioteksservice. The Royal Library in Copenhagen, however, has contracted the production of the national bibliography to Dansk Biblioteksservice which also maintains an index to Danish journal articles.

In Norway the academic libraries set up a cooperative system called BIBSYS in the mid-seventies.[13] In addition to the catalogue it includes ILL and local modules such as circulation, acquisition and periodicals management. It uses UNINETT instead of a dedicated network and this has made it possible to integrate Internet services like Gopher and e-mail into the system.

The Oslo University Library which is also the national library runs the UBO:BOK and TRIP databases, the core of which is the national bibliography and the union catalogues of monographs and periodicals. In addition to that many other databases have been mounted, for example an index to Norwegian journal articles, subject bibliographies and catalogues of special collections.[14]

In Finland the KDOK databank was set up in 1980 by the Automation Unit of the Finnish Research Libraries (TKAY). The online host is the State

Computer Centre (VTKK). The KDOK-databank contains several databases: the most popular among them are the Index to Finnish journal articles, the union catalogue, the national bibliography and the Nordic union catalogue of periodicals.

The KDOK databank will be supplemented and partially replaced by databases in the LINNEA central system.[15] These will include LINDA (the union catalogue of the academic libraries) and several others. As a whole LINNEA is a very practical solution to the problem of interconnecting central and local systems. All Finnish academic libraries have installed the VTLS system. With FUNET as a high-speed communication link this allows for a smoothly working distributed environment.

In Iceland the University Library and the National Library have recently installed the Libertas system to serve as the local OPAC and to host the union catalogue. It is also used to produce the national bibliography.

The LIBRIS System and its Development Plans

The Swedish LIBRIS system was among the first European bibliographic utilities and is one of the largest bibliographic databases in Europe. At present it contains four million titles including records from LC (Library of Congress), BNB (British National Bibliography) and the Deutsche Bibliothek. Its main strength is the fact that all academic and special libraries in Sweden do their cataloguing online in LIBRIS. Most of their ILL activities are also handled by a special e-mail function within the system. The Royal Library is in charge of the operation and development of LIBRIS. From 1980 to 1991 the government computer centre DAFA was running the daily operations but in 1991 the system was transferred to Ericsson Data Services. Costs were substantially reduced and a better development environment has been created. The core programs of the system have been the same since 1980 but many new functions have been developed.

During the eighties most of the LIBRIS member libraries acquired their own local systems and this has created a highly heterogeneous environment. In Sweden, foreign systems like VTLS, Geac, Libertas, DOBIS/LIBIS, TINLIB and BIBDIA are all represented, and interfaces to LIBRIS have been developed by the vendors. LIBRIS is used for cataloguing and records are loaded into the local systems by tape, file transfer or downloading.

LIBRIS development projects reflect current international trends and include retroconversion of older material, connectivity via SUNET, improved

ILL routines and further development of intelligent interfaces. New databases have also been added: the Swedish national bibliography 1700-1829, an authority file of personal names and corporate bodies and a database on womens' studies. More databases will be included and a gateway to selected services on the Internet is scheduled for 1993. A subset of the Book Data database is also being mounted in 1993. Like many other bibliographic networks the LIBRIS system is in the process of being transformed into an all-purpose 'information utility' serving not only libraries but also end-users.

Development Plans of the Other Nordic Bibliographic Networks

The Nordic bibliographic utilities are in a state of change and many interesting development projects have been initiated. In Denmark there is an ambitious project called DANBIB, the aim of which is to unify all bibliographic resources within a distributed system based on UNIX and client/server technology.[16] The central database will comprise both ALBA/SAMKAT and BASIS and there will be standards for communication with the local systems, in the first phase SQL and later possibly SR (Search and Retrieve). The query language will probably be CCL since most Danish library systems already use this standard. DANBIB will comprise the national bibliography, a union catalogue for all Danish libraries, local and regional catalogues, legal deposit material, a journal index, analytical records and some non-bibliographic databases. There will also be ILL routines.

In Norway, BIBSYS is working towards developing BIBSYS III which will be based on client/server technology and distributed data processing.[17] BIBSYS uses the database management system ADABAS and the programming language NATURAL. Systems development is managed in-house and all the BIBSYS libraries use the system for house-keeping routines as well as OPACs and interlibrary loans. Due to a strategic decision by the BIBSYS Board in 1988 to use UNINETT instead of a dedicated network, the BIBSYS system is extremely well integrated in the academic network. For example there is a BIBSYS gateway to selected library services on the Internet and it is also possible to search BIBSYS with the search facility that is part of the Gopher protocol. BIBSYS has integrated an experimental SR client which makes some of the Oslo TRIP databases appear as if they were BIBSYS databases. This is not yet a regular service but will probably be so from 1994.

LINNEA in Finland is also in a stage of rapid development. Almost all the 22 VTLS systems are installed and the central union catalogue is now being automatically produced by transferring records from the local systems to a special database called LINDA. ILL will be easily managed since the individual member systems can communicate with each other transparently. Support for the Z39.50 standard and the use of FUNET will also make sure that LINNEA will be an open system.

The Nordic SR-Net Project

The Nordic SR-Net Project is of strategic importance within the Nordic library community. The Nordic bibliographic utilities are implementing SR (Search and Retrieve/ISO 10162-63). SR is a functionally equivalent subset of the American standard NISO Z39.50, a variant of which is also used in WAIS (Wide Area Information Servers).[18] The two standards will, it is hoped, be compatible and new functions are continuously added to SR. SR supports features for the interrogation and exchange of bibliographic data; however features to support the handling of non-bibliographic materials such as full text and images will be incorporated. This is already under way in Z39.50.

The choice between SR and Z39.50 poses a dilemma because Z39.50 is used more widely than SR and there are already many working implementations of it, mainly in the United States. On the other hand, SR is the international (ISO) standard and it is supported by the EC. The obvious solution is to support both standards or to use a gateway between the two protocols. SR and Z39.50 are both defined in an OSI context; but Z39.50 is largely implemented over TCP/IP. The Nordic SR-implementation is of the "thin" OSI brand, ie it uses some OSI functions on top of TCP/IP. The project, however, also intends to support Z39.50 over TCP/IP in addition to SR.

The main advantage of SR (and Z39.50) is that databases and user interfaces can be completely separated, communicating via the protocol. This is achieved with the help of the SR protocol machine (SRPM), the software that runs the SR protocol itself. SRPM can be run on a separate machine or in conjunction with one's own system. Together with the SRPM goes an API (Application Programmer's Interface) to which all interested parties can develop their own interfaces. One can translate a system's native language to produce APDUs (Application Protocol Data Units, ie protocol strings) to the API or develop a special interface. Some functions in SR are mandatory and some optional and for this reason, as with other OSI protocols, an ISP (International Standard Profile) has to be developed by implementors to describe which additional functions are supported. Unfortunately, two profiles are not necessarily compatible.

The Nordic SR project started in November 1991 and it is funded mainly by NORDINFO.[19] The project partners are UBO, USIT, (The Information Technology Centre of Oslo University), BRODD (The R&D Department of the Norwegian Library College), BIBSYS, LIBRIS, FEK and TKAY. Iceland has observer status. It is scheduled to be completed in early 1994 and will then probably be followed by a new project which aims at introducing new SR functions and possibly the ISO ILL standard (ISO 10160-61) or the subset of it currently implemented by the ION (Interlending OSI Network) Project. The core of the subsequent activities will, however, be to develop, maintain and refine the implementations.

A software package consisting of the protocol machine, a high level API, a simple client and support for server software has been developed by USIT and is now installed by all the project members except TKAY which will use the Z39.50 module of the VTLS system. The client and server software is so far tested on one of the TRIP databases in Oslo and the BIBSYS database and it works well. After the completion of the project it will probably be put in the public domain and be freely available from the NORDUNET file server.

The project uses the software ISODE (ISO Development Environment) on top of TCP/IP. ISODE contains a complete set of basic OSI-services including ACSE (Association Control Service Element) and ROSE (Remote Operations Service Element). It also supports the use of the OSI notation ASN.1 (Abstract Syntax Notation One) and BER (Basic Encoding Rules).[20]

BIBSYS has a working SR prototype integrated in its system. UBO/USIT is testing client (origin) functions and has extended support for server (target) functions to another TRIP database and the Norwegian union catalogue. For some of the project members the major difficulty has been the interaction of UNIX machines and existing 'old-fashioned' application software residing on IBMs or other mainframes. This is especially true for LIBRIS which is run by a service bureau and uses the STAIRS information retrieval system in conjunction with in-house developed software. ALBA has the same problem and the situation is further complicated by the decision to implement a new solution for the union catalogue. BIBSYS has solved the problem with the help of software developed by Cornell University for the adaptation to ADABAS and its programming language NATURAL.

One of the most difficult and time-consuming parts of the project is the conformance testing which has to be done according to a very strict ISO methodology (ISO 9646).[21] It consists of developing abstract test suites and translating them into actual tests of the SR protocol machine. To this end the project uses the services of a subsidiary of Swedish Telecom (Telia Research AB) which is one of the very few specialists in this area. An abstract test suite which comprises 30 test cases is now completed. This test suite will be of great interest to other SR implementors since it can be used by them as well as the Nordic project and save them a great deal of money and effort. It also guarantees that the implementations really conform to the protocol.[22]

Until now the project is on schedule but one can foresee that there will be delays later on when it comes to fine-tuning the adaptations between existing mainframe software and the protocol. This concerns mainly LIBRIS but FEK will have to wait for a new working solution for ALBA scheduled for early 1994. The Finnish participants are dependent on the Z39.50 implementation of the VTLS system which is under way. The alpha version of the client software is already available as a PC-program based on Windows and PC/TCP, and the server software is expected by the end of this year.

To sum up: the experiences of the Nordic SR project seem to confirm that SR/Z39.50 represents a viable path to opening up systems and separating user interfaces and databases. There is a well-founded hope that the project will succeed and result in an important first step on the road to truly open systems.

A Note on the IANI Project

The IANI project (IANI=Intelligent Access to Nordic Information) was initiated in 1987.[23] Its aim was to develop an intelligent PC-based interface to Nordic bibliographic networks and databases as well as some international hosts like Dialog and DataStar. The software was completed in 1989 and it is used by many libraries. After its completion many difficulties have arisen. Whenever a host changes a feature the software has to be changed and this problem is shared with many programs of the same kind.

However, IANI will be ported to a UNIX environment at the University Computing Centre in Helsinki and will probably be available through the Internet. In comparison with IANI the main advantage of SR/Z39.50 is that the standards do not change and this places the responsibility of interface development on the library systems themselves. This kind of distributed responsibility is shown to have worked very well within the Internet and is the key to its overwhelming success.

Discussion

Some current international trends within library automation and information networking can be discerned. The most important ones are, in my opinion, the following:

- Connectivity via the academic networks.
- Migration to open and distributed systems running on standard hard- and software (ie in most cases, support for UNIX and TCP/IP).
- Client/server technology and emerging standards (SR/Z39.50, ILL, SGML, EDIFACT, X.12).
- Massive retrospective conversion of card catalogues. Digitization of documents and pictures.
- Third generation of OPACs, intelligent user interfaces and more refined retrieval techniques. Locally mounted databases. Campus Wide Information Systems.
- Central bibliographic services change their roles from library service providers to 'information utilities'.
- More non-bibliographic databases and full-text databases.
- More CD-ROMs and CD-ROM networks.
- Electronic publishing, electronic ordering and electronic document delivery. Converging interests of publishers, libraries and other information providers.

Following is a summary and evaluation of Nordic developments in some of these areas.

Open and Distributed Systems

Library automation has, of course, always reflected general developments in computing and telecommunications. In the seventies there were only central systems. In the eighties the minicomputers and PCs made the introduction of local systems, OPACs, LANs and better user interfaces possible. The nineties will certainly be the decade of high-speed networking, open and distributed systems, standardization and graphic user interfaces.

In the Nordic countries the DANBIB partners (FEK and Dansk Biblioteksservice), BIBSYS (Norway) and Bibliotekstjänst (Sweden) are all planning or already in the process of porting their systems to a UNIX environment with standard database management systems. LINNEA and LIBRIS follow different paths but still conform to the general pattern. The LINNEA system represents a distributed solution which relies on one vendor. VTLS is, however, in the technical forefront in many respects and has developed many advanced functions, eg image processing, management of full-text databases and a journal indexing subsystem. The LIBRIS environment has already been described. The strategy is to provide the system with a new superstructure which allows for smooth interacting with local systems, intelligent interfaces and new services like additional databases and a gateway to Internet resources. LIBRIS is also opening up by way of connectivity via SUNET and the future use of SR.

Changing Role of the Central Library Services

In the eighties, when the local library systems were introduced, many experts predicted the imminent decline and fall of the central bibliographic services but on the contrary they seem to have strengthened their positions. The real giants like OCLC and RLIN are more used than ever before and they have evolved into 'information utilities'. The central core of shared cataloguing and ILL is still the most important part of their activities but many other functions have been added. Reference databases as well as full-text sources have been mounted in addition to the bibliographic databases and this wealth of information is used both by libraries and end users.

On a much smaller scale the Nordic bibliographic utilities conform to the same general pattern. A good example is UBO (the Norwegian National Library Service) which has mounted a lot of special databases in conjunction with the union catalogue and the national bibliography. A videotex interface has also been developed and a new datafax ILL service has recently been introduced. Most of the 'utilities' are producing CD-ROMs containing union catalogues and national bibliographies.

Connectivity

All Nordic bibliographic utilities are connected to the academic networks and some of them use them as their main communication medium. In general, the Nordic countries play an important role within the European academic networks and use them heavily: the central Gopher and Archie services have already been mentioned and they are heavily used from all over the world. Most of the OPACs of the academic libraries are connected to NORDUNET, and several of the bibliographic utilities have implemented, or are about to implement, gateways to other Internet libraries and information services. The SR project represents a determined effort to go one step beyond connectivity and virtually merge the Nordic central bibliographic services into one single resource for shared cataloguing and information retrieval.

Electronic Publishing, Network Publishing and Document Delivery

Electronic publishing has at least two aspects, network publishing and other forms of electronic publishing like CD-ROMs and other media intended mainly for 'local' consumption. Network publishing has not made much progress in the Nordic countries except for newsletters and text archives on the academic networks. Publishers still do not show much interest in this new area. This is perfectly explicable since the academic networks are not available to a wider public and the R&D sector is not sufficiently large to motivate the publishing of academic electronic journals. However, one can foresee an increasing amount of research reports, informal journals and newsletters published by the academic institutions themselves as the use of the academic networks increases.

Electronic publishing in the shape of full-text databases of newspaper material are available on commercial hosts like Affarsdata (Sweden) and Aftenposten (Norway). CD-ROMs are produced by some publishing companies, mainly dictionaries and encyclopedias. CD-ROMs are also published by the bibliographic utilities. The union catalogues of foreign literature and the national bibliographies of all the Nordic countries, except Iceland, are available on CD-ROMs.

Online ordering of interlibrary loans and photocopies is an integrated part of the central bibliographic services but delivery of the documents themselves is still usually managed the traditional way. There is a well established online connection to the BLDSC (British Library Document Supply Centre) and other major European suppliers called DOCLINE which is managed by the Chalmers School of Technology in Gothenburg. The Medical Information Centre at the Karolinska Institute in Stockholm also runs an online ordering service.

FEK in Denmark has started an experimental ILL function connected to ALBA which checks the loan status of documents in the local systems. The University Library of Oslo has developed a datafax service connected to the union catalogue of periodicals in the TRIP system. Users check the holdings and decide where to order from. The request is then forwarded to a server which sends a fax to the appropriate library. In 1992 more than 100,000 requests were sent in this way.

NORDINFO has supported experiments with Group 4 fax machines. They were quite successful but the technology is still too expensive to be used extensively. Recently a new NORDINFO-project has been initiated, the aim of which is to use and evaluate the RLG ARIEL equipment for scanning and transmitting documents over the Internet.[25] The Nordic technical and medical libraries are involved and the service seems to work but according to preliminary evaluations the scanning is considered to be too slow to be really convenient. Another problem is the use of TFTP instead of ordinary FTP.

The use of the fax delivery and e-mail systems of the new document supply services is increasing but still not very common. One explanation for this is that the Nordic library community is self-sufficient to a considerable extent. However, this may change and many of the largest academic libraries and some special libraries use the services of OCLC, Uncover2, Article Express, FaxonFinder etc. BLDSC is, of course, traditionally very much used for material which is not available in the Nordic countries. One can foresee that there will be Nordic initiatives along the lines of the Pica RAPDOC project.

Conclusion

Information networking in the Nordic countries is now entering a dynamic phase. The PC revolution and the interconnection of LANs and WANs, is enabling the construction of a new information infrastructure. Client/server technology and new protocol standards are being implemented and the ultimate goal is that the data communication networks should be as easy to use as the ordinary telephone networks. Nordic countries face similar challenges to elsewhere: how best to organize resources; copyright issues; technical solutions to authentication and charging issues. An extensive upgrading of the networks to high-speed lines is required and is under way.

In the Nordic countries there is a substantial increase in the use of TCP/IP networking, as well as activity within the business sector which aims at interconnecting different types of LANs and WANs. The slogans of the day are multiprotocol networking, workgroup computing and access to networked resources. All this is already a tangible reality on the academic networks, whose strength is that information resources are distributed as well their management, and that protocols and standards like Gopher, WAIS, X.500, and services like Archie are beginning to be used to structure the enormous wealth of information.

Despite the ingenuity of these services, much remains to be done in organizing access to resources. A very important process is the emerging use of information retrieval standards like Z39.50, SR and SQL. One can foresee that campus-wide information systems, organizational networks and commercial hosts will develop their own client interfaces with tailor-made selections of relevant information resources. It will be possible to access an increasing number of databases through the same local interface or the interface of a remote service. PC- or workstation-based clients will also proliferate and make it possible to develop personal information systems.

From a library perspective the academic networks are especially important. It is, however, of great importance that internetworking is extended to the public and private telecommunication sector. This means that there will also be room for commercial services. This development is already evident in the United States and the same thing will probably happen in the Nordic countries.

Within NORDUNET more than 60,000 computers are connected to the academic networks and the backbones have been upgraded to 2 Mbit/s and in some sections to higher speeds. Further upgrading to 34-35 Mbit/s is planned or imminent. What we may now need is initiatives like the US NREN program to enhance the network infrastructure and expand access to it, and the Coalition for Networked Information, to lobby for improved information services and to promote awareness. It is important to establish a forum for contact between academic and other computer centres and libraries. Libraries are among the most important information providers, alongside commercial database hosts, and it is crucial that librarians assume a very active role in shaping the future information infrastructure.

Norway and Finland have established a framework for coordination of information resources and in Denmark UNI-C has a very close contact with libraries. In Sweden, however, the scope is more limited. The Royal Library has assumed the role of coordinating the academic and special libraries and fullfils it in a very efficient way. A formal framework for cooperation between libraries, computing centres and other information services, however, does not exist. There is no conscious information policy on the national level, and groups like the CNI in the US, and UKOLN the Office for Library and Information Networking in the UK, do not exist.

Sweden, like many other West European countries, has a well developed information infrastructure in the shape of very good academic and public libraries, online services and a transaction framework for industry and the business sector. The data communication networks are also advanced. The information infrastructure is already in place or under construction but the information resources themselves are scattered. There is also a looming uncertainty about what the mythical 'end user' really needs and how user-friendly systems should be constructed. Technology is said to be neutral but in reality it can create new needs and the overall goal of information networking must be to promote intellectual productivity, creativity and international cooperation.

Librarians should play an important role in shaping a national information policy. Some of us must become information professionals and generalists. The traditional role of libraries as storehouses of printed information will of course always be the core activity of libraries but helping users to navigate the new electronic information universe is an increasingly important task. Many libraries and bibliographic services create, store and provide electronic information themselves and the professional expertise of librarians will be needed. It is necessary to cooperate with other information providers to design and structure systems and promote the use of networked information. To achieve this, much professional development and a conscious strategy will be needed but it is also a very exciting challenge. If we miss this opportunity there is a substantial risk that users will bypass libraries and use other information services where electronic information is concerned. This might not be a catastrophe but it would certainly be a waste of competence and resources.

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The Nordic SR-net Project : Implementation of the SR / Z39.50 Standards in the Nordic Countries

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Abstract

The Nordic SR-net project started in 1991, with the aim to develop communications between university library systems and union catalogues in all the five Nordic countries, based on the ISO protocol Search and Retrieve (ISO 10162 and ISO 1063). The plan was to develop totally integrated solutions, where the user interfaces of the remote systems would be hidden, and the user could use her/his own, well known interface from her/his "home" system.

The protocol software (the protocol machine) was developed for a UNIX platform, while none of the library systems in the participating countries were running on UNIX. This was only one of the big challenges.

The project was funded by NORDINFO, and has a budget of FIM 3 000 000 ($500 000).

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The Nordic SR-net Project - Building the Floor of the Virtual Library?

A lot of noise has been made the last years around the terms *virtual library* and *electronic libraries*. The meaning of these words is not very clear, and several definitions are floating around, but one of the common denominators is communication. A clear understanding has grown, that, in order to make a virtual library of some kind, the libraries have to communicate, and not only through the old ways of union catalogues, terminal access, etc. What is needed is a way to make the computer systems in the libraries communicate, and the only way to obtain this is through standardisation.

In the library community two basic standards have been developed for interlibrary communications, the Search and Retrieve standard (SR) and the Inter Library Loan standard (ILL).

The Nordic SR-net project started in autumn, 1991 by NORDINFO, an organisation where all the five Nordic countries are participating. The funding from NORDINFO was approximately £300,000, and in addition to that, the participating organisations were committed to supply at least the worth of 300 work hours each.

The participating organisations are:

Organisation	System(s)
University of Oslo, Norway	UBO:BOK, the Norwegian union catalogue and National Bibliography. TRIP, several databases, among them the Nordic Union catalogue for periodicals. Both systems running on VAX/VMS
LIBRIS, Sweden	LIBRIS, the union catalogue for research libraries. OPAC, based on STAIRS database running on an IBM mainframe
BIBSYS, Norway	BIBSYS, the library system of the university and research libraries in Norway. Developed on ADABAS, NATURAL. Running on an IBM mainframe

University of Iceland	LIBERTAS, a British system running on VAX/VMS
BRODD The R&D department of the Norwegian School of Library and Information Science	BRODD is project leader
TKAY, Finland	VTLS, running on HP 3000.
FEK, Denmark	ALBA, the Danish union catalogue, on a UNIVAC mainframe. This is now being moved to a new system running on a UNIX platform, and renamed DANBIB.

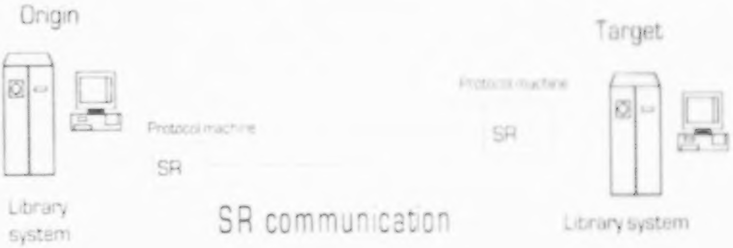
Total Integration

The aim of the project is to implement the SR standard for communication between all the participating systems in a way that makes it completely invisible to the end user. The user of BIBSYS should be able to search the TRIP databases in Oslo without having to know that she/he has left BIBSYS, and without noticing any difference in the user interface. The systems should also be able to communicate with all other implementations of the SR standard.

This of course called for close co-operation with developers and vendors. Fortunately the developers of the Norwegian and Danish systems have participated in the project. The TRIP and STAIRS systems are not accessible internally, but they have well defined APIs that make access to the database engines relatively easy.

Not a Client/Server Solution

Some people have compared the SR way of accessing remote databases to the client/server approach, and indeed there are similarities, but when looking closely at it, the differences become very visible.



In a normal client server database system the client will have to have detailed information on the query language and the structure of the database he/she is accessing. In a SR environment this is not necessary. The two protocol implementations communicate through standard attribute lists for identification of files. Also, the protocol machines will communicate through a query language that is independent of the query languages in the database systems. In the SR protocol the Reverse Polish Notation (RPN) is mandatory query language, while CCL (Common Command Language) and private languages are optional.

OSI - TCP/IP or Both?

The SR protocol is a protocol for the 7th layer in the OSI stack. When the project started we had to decide if we were going to implement the full stack, or if we should find other solutions. It was quite obvious that a full OSI stack could become rather expensive, and could make it difficult to communicate with other implementors. Additionally, all the participating organisations were on the Internet, running TCP/IP. The decision was made to implement SR on top of TCP/IP, but within a stack of OSI ACSE, presentation layer, session layer and transport layer. ISODE was chosen as the tool for the implementation of the stack.

ISODE was public domain at the time, and was rather well known. It was developed mainly for educational purposes, as a migration tool on the way from TCP/IP networks to OSI networks. The main drawback is that it is rather slow.

We decided that ISODE would fill our project's needs in the implementation phase, but that it should be used in a way that made it easy to take it out, and plug in something else.

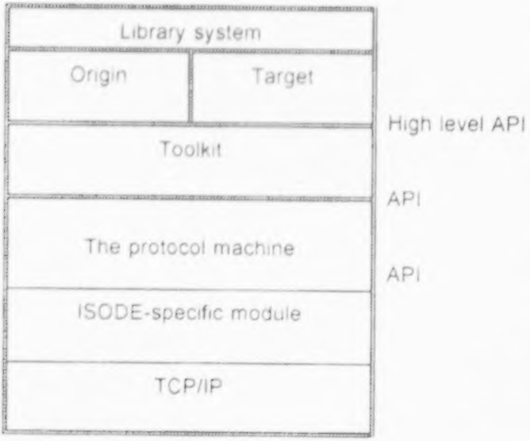
Another problem was the fact that ISODE was developed for UNIX, while none of the participating systems were running on UNIX. This meant that we had to implement the protocol machine on UNIX "front-ends" to the library systems, and implement communications with the host machines ourselves. Not surprisingly, the IBM mainframes were the problematic ones, but we managed to solve those problems eventually. In the BIBSYS system, this is in fact done by using a public domain assembler program.

The SR Tool Kit

The project decided to use only Reverse Polish Notation as the query language, and UNIMARC as the main exchange format.

This meant that we are now developing tool kits for converting query languages to and from RPN, and between UNIMARC and most known MARC formats. The project will also support USMARC and UKMARC as exchange formats.

This will be a part of the final SR protocol machine, and the machine will thus look like this:



The high level API is a simplified interface to the protocol machine, hiding some of the error checking, keeping control of reference ids, etc. The conversion routines and other tool kit routines will also be found at this level.

The above shown figure shows the modular approach to the implementation, and the isolation of the ISODE-specific parts. This will make it relatively easy to replace ISODE later on.

Where are We Now?

A generic protocol machine, with a target, and a primitive stand-alone origin system, was developed shortly after the API to the protocol machine was defined. This work was done mostly at the University of Oslo. This software was distributed to all the participating institutions, who were able to use it almost unchanged for their own systems.

At this moment (early October), three target implementations are running. The TRIP databases and the UBO:BOK in Oslo can be accessed through SR.

The BIBSYS library system in Trondheim has been running both an origin and a target since this spring. This means that when the test period is over the BIBSYS users will have access to totally integrated SR services.

LIBRIS in Sweden have to let their database hosts, Ericsson, do much of the implementation work, and there have been some delays. But a prototype target system will be running in November.

FEK in Denmark have been working on the new system for the Danish union catalogue. This system will be in production from January 1st, 1994 and SR services will be integrated. The prototype should be running by the end of October.

TKAY in Finland have been reporting to VTLS, who have produced a PC client for the Z39.50 standard. VTLS are also working on a target system. The VTLS implementations are directly on top of TCP/IP, which makes it impossible to communicate with the rest of the systems in the project at the moment.

LIBERTAS are working on a SR/Z39.50 implementation, and they are co-operating with the University of Reykjavik on this.

Where are We Going?

There are two major problems that have to be solved:

1. The communication with Z39.50 over TCP/IP

   Z39.50 is the American flavour of SR, and is effectively a superset of SR. The only known problem in communications between implementations of the two different standards is that the object identifiers for the field attributes are different. This can be solved without many problems.

   Unfortunately most of the Z39.50 implementations have been made directly on top of TCP/IP. This makes it impossible to communicate with the Nordic SR-net implementations without gateways.

   The SR standard is the international standard, and of course the Z39.50 implementors should have to adjust. But that is in the virtual world. In the real world we have to communicate, and the number of Z39.50 implementations is higher than the SR implementations.

   The Nordic SR-net project is now looking into ways of implementing dual stacks, that will make us able to identify what stack we are communicating with, and to communicate with both the American and the international standard implementations. Hopefully this problem will be solved by the end of the year.

2. The problem of ISODE

   The standardisation committees are now looking into standard ways of running OSI protocols over TCP/IP. One of the most interesting solutions to this is MOSI - Minimal OSI. From what we see now this will be far superior to ISODE in efficiency, and it will probably be easy to implement in our system as a replacement to ISODE.

The Future

With SR we can build parts of the virtual and electronic library, but if we shall be able to put virtual books and articles on our virtual shelves, we shall need more. We shall need automatic interlibrary loans and document delivery. Hopefully this will be our next project.

New Developments in Standard Numbering

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Since 1986 Hartmut Walravens has been Director, Bibliographic Services, Berlin State Library (which includes responsibility for the German Serials Data Base (ZDB)), and Director of the International ISBN Agency. As of 1993 he is also Director of the International ISMN Agency.

Abstract

Standards in the information and library fields are indispensable. Identification and retrieval as well as systems communication depend heavily on implemented standards. Standard numbering has been a most efficient tool for publishers, the booktrade and libraries during the last 25 years; it has led to rationalization, more efficiency and higher speed of most operations. With the development of new media the coverage of standard numbering systems has been extended: electronic publications, computer software, and even online databases now fall under their scope. A new standard covers printed music; it offers the same options as ISBN and ISSN and will enable the music trade to rationalize its operations, especially in connection with the EAN bar code. Current discussions focus on a wider use of the SAN, the Standard Address Number, and similar location codes which would be another major factor of rationalization.

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The International Standard Book Number (ISBN) has become a household word in the book sector. But while the numbers show up on most printed publications nowadays there is a considerable lack of information on the development and benefits of the system, especially for libraries. Libraries, however, soon recognized the high potential of the ISBN for resource sharing.

Background

The ISBN system, originally started in the United Kingdom in 1968, is based on ISO standard 2108. It is a simple identifier without any bibliographic pretense. It is applicable to all monographic publications including educational videos, computer software etc. An ISBN always comprises ten digits, the first element of which is the group number, a code for the country or area of publication, the second indicates the publisher, the third identifies the title of a publication, and the last one is a check digit. All these components, except for the check digit, are variable in length. This makes the system flexible enough to accommodate large publishers as well as medium-sized or small ones, without wasting numbers. The key to the publishers' prefixes are national listings as well as the *Publishers' International ISBN Directory* edited jointly by K. G. Saur in Munich and the International ISBN Agency in Berlin. This directory contains almost 300,000 publishers' names and addresses from all over the world. Titles may be found in the national bibliographies and the regional *Books in Print* publications, some of them are available on CD-ROM. The ISBN is a routine access key to these reference tools.

The ISBN system is designed to suit the needs of the booktrade, and the necessity for rationalization in the book sector made it a huge success. Nowadays 129 countries of the world are ISBN members, and more than 200,000 publishers use the ISBN. This means that comparatively few books are published without ISBN.

International Standard Serial Number (ISSN)

Serials receive International Standard Serial Numbers (ISSN, ISO 3297). Many countries are members of this system that provides unique identifiers for periodicals and other serials. The registration authority for the ISSN standard is located in Paris; it keeps a complete file of all ISSNs allocated, with the respective cataloguing records. The whole file is available on CD-ROM *(ISSN Compact)*.

International Standard Music Number (ISMN)

The International Standard Music Number[1] (ISMN, DIS 10957) is about to be published as an ISO standard. It covers printed music only and will be implemented at the beginning of 1994. The registration authority is the International ISMN Agency at the Berlin State Library (Germany). An instruction manual is in preparation.

Background

When the ISBN proved to be a comprehensive rationalization tool for the booktrade, the music publishers also advocated a similar standard number for printed music. A retarding element in the discussion was the controversy whether a simple identification number would suffice or a bibliographic code was needed which represented eg also the link between the score and the individual parts. When the International Association of Music Librarians, Archives and Documentation Centres (IAML) addressed the International ISBN Agency with a proposal of a ten digit number without bibliographic codes this scheme was published in *ISBN Review* and immediately found wide acclaim. ISO/TC 46 accepted the proposal officially as a work project, and an agreement between European and American publishers and specialists was reached at a meeting of experts in Ottawa in 1990 after intensive discussions. The main arguments to discard the previous idea of a 13 digit number were the long-standing experience with the ISBN and the option of incorporating a ten digit number in the EAN system. The ISMN draft was processed by ISO gremia in record time and will be officially available as of the beginning of 1994 (the standard is in press at the present time).

The main differences between ISMN and ISBN:

- the first digit is the constant «M»;
- there is no group number as music is international.

Both numbers comprise ten digits and may be integrated in the EAN system. The ISMN offers the options of a complete rationalization of music publishing and the music trade as well as music libraries.

Scope of the ISMN

The ISMN is used to identify music publications, whether available for sale, hire, gratis or for copyright purposes only.

The ISMN is not used for sound or video recordings (except in the rare case noted below): for these media the International Standard Recording Code (ISRC) should be used. Nor is it used for books on music which will receive an International Standard Book Number (ISBN).

Each separately available constituent part of a publication must receive its own ISMN.

Items to be numbered include:

- Scores
- Miniature (study) scores
- Vocal scores
- Sets of parts
- Separately available individual parts
- Pop folios
- Anthologies
- Other media that are an integral component of a music publication (eg. a tape recording that is one of the "parts" of a composition)
- Song texts or lyrics published with the printed music (if available separately)
- Commentaries published with the printed music (also available separately)
- Song books (optional)
- Microform music publications
- Braille music publications.

The following are NOT to be given ISMNs:

- Books on music
- Stand-alone sound or video recordings (including recordings available on computer media).

International Standard Recording Code (ISRC)

As already mentioned there is also a standard numbering system for sound recordings - the International Standard Recording Code (ISRC, ISO 3901).

It identifies, however, the individual items on a record or CD, and not usually the physical item. It is very useful for the calculation of royalties but not necessarily for trade or library purposes. The registration authority (IFPI) is located in London.

A standard numbering system for articles in serials has been discussed for many years but, unfortunately, so far without success.

These systems are not static but dynamic: The standards are revised in intervals of four years to adapt to the latest technological development. So the ISBN and ISSN now also cover electronic publications and certain kinds of multimedia.

Electronic Publications (EP)

Background

So far electronic publications[2] are only sporadically covered by standard numbering systems because these new media are often not part of the traditional publishing routine. There has also been some doubt among experts if the traditional numbering systems are sufficient or if these media require a new approach. An analysis has proved, however, that the existing systems do cover the whole range of electronic publications.

Need of Standard Numbering of EP

While offline products are relatively similar to printed or multimedia publications the necessity of numbering online EP may require some explanation:

- unique identifiers serve to secure bibliographic control for an area hitherto characterized by very sporadic bibliographic control;
- the unique identification of a database will make cooperation between producers and hosts easier;
- the unique identification of a database will further improve means of quoting information found in databases, thereby making documentation of information easier and more reliable - also from the legal point of view;
- a unique identifier allows cross-referencing between a database and related products;
- a unique identifier serves as a control number in databases of databases[3].

Definition

Electronic Publications (EP) are

- (offline) publications issued on electronic media, generally distributed in multiple copies (eg CD-ROMs or other form of optical disks, floppy discs);
- online publications which are distributed over computer communication networks.

Electronic mail, bulletin boards and similar communications are not considered EP even if they are occasionally quoted as references in scientific papers.

Assignment of Standard Numbers

1. Offline publications

CD-ROMs, floppies and similar EP will be eligible for either ISBN or ISSN depending on the periodicity of publication:

- items which are published only once, or several times, either unchanged or revised, and are considered self-contained, may receive ISBNs;
- items which are published at periodic intervals and bona fide indefinitely, receive ISSNs (eg a journal on floppy disc);
- items which have basically the same contents but are continuously revised and are published at certain intervals (eg *Books in Print*) may receive both ISBN and ISSN.

Such offline publications are treated in analogy to print media.

2. Online EP

Online EP that form a database that is or is not changed or updated but is not made available in installments and does not require a citation with volume, issue, or number (or similar information) is considered a monograph and may receive an ISBN. This kind of EP may be seen as an analogy to a dictionary, a loose-leaf publication or an encyclopedia.

Online EP that are released periodically (eg electronic journals), or added to not continuously but in certain intervals only, may be regarded as serial publications and receive ISSNs. Also online EP that require for citation additional information on volume, issue or number (or similar information) are eligible for ISSN.

Online EP offered by different hosts may be accessed in a different way and may also differ in content; they are therefore considered different editions of the same product.

In the case of ISBN - different ISBNs are assigned; the publisher prefix is the one of the original publisher/producer not the host who would be considered the distributor. If the hosts only serve as gateways, the publication available is the same anywhere with the same ISBN.

In the case of ISSN - the same product keeps the same ISSN. Only significant changes of content necessitate a different ISSN.

Cross references should be made in directories in the same way as it is done for offline publications.

Display of the Standard Numbers

1. Offline EP are treated in analogy to print media. The standard numbers should appear on the title screen, a permanently affixed label and the box. The number may also be included with the copyright statement in a special section on a CD as eg on music CDs.
2. The standard numbers of online EP would be part of the title screen. They may in addition be used for the log-on procedure which would make them part of the EP environment. They would be registered in directories and provide cross references for other editions (ie the same or similar contents on another host) and offline products.

Electronic Data Interchange (EDI)

Computers are nowadays widely used in the book sector and there is an enormous need for communication - data are passed from the publishers to the booktrade and on to the libraries. The customers order books and receive status information; invoices and chasers are sent; bibliographic information is used throughout the book sector as the basis for many transactions. Still very often this data is printed out and then re-keyed later on. The familiar reason is that the automated systems were acquired usually from the point of view of cost-efficiency not compatibility.

EDI (Electronic Data Interchange) aims at the direct communication between computer systems without the need of time-consuming printing and re-keying and at avoiding errors and delays. This is possible because of the

ISBN which is a rather trivial number in itself but the basis for a complex infrastructure. EDI is not new in the book sector - teleordering systems in a number of countries have been using it successfully for years. As long as only few data elements are needed - like ISBN and the quantity for ordering - the procedure is very simple and not prone to errors. But more complex messages like invoices, confirmations, status information, credit notes, chasers, fund transfers, bibliographic and sales information require standard EDI formats.[4]

Recent trends show a movement from national standards (like the UK retail standard TRADACOMS) to a global standard, EDIFACT. A number of organizations like BIC (Book Industry Communications) in the UK, Editeur (the European EDI group) and BISAC in the US are busy developing such standards several of which are available in print now.

An important element in electronic communication is the standard address number (SAN). While the US has been using the SAN for years it has spread slowly to some European countries like the UK and the Netherlands. On the other hand the national EAN organizations promote their location codes which, however, still have disadvantages for international applications, eg different check digit calculation, which make them incompatible. The German-speaking area, for example, has its own system of "Verkehrsnummern" which serve as membership numbers for the Börsenverein as well as the BAG and other purposes. More standardization would be highly desirable.

Bar Coding

The universally applied bar coding system in the book sector is the EAN 13 code known as ISBN Bookland EAN. It integrates the complete ISBN and facilitates the scanning of the number.

Progress has been made in several respects:

- In the United States two bar coding systems have been competing, namely the price-point UPC (Universal Product Code) mainly used by drugstores and supermarkets and the ISBN Bookland EAN favored by bookstores. The latest attempts to meet both the needs of the supermarkets and the bookstores with regard to mass-market paperbacks resulted in an agreement to print the ISBN Bookland EAN also on these paperbacks (starting some time in 1994). The publishers are willing to supply stickers carrying either a publisher-specific or a generic publisher code and the price-point to cover the Bookland EAN to the independent distributors selling to food and drug retailers as dual coding proved to cause many scanning problems.[5]

- For shipping purposes the book industry in the US decided to use the ISBN Bookland EAN as the primary product label and the ship-to and ship-from standard address numbers in the form of an EAN location code. The prefix 979 was favored but has not met the approval of the EAN organization.
- Kluwer and Wiley are using now the issue-specific information in the SISAC bar code symbol on their journal covers. SISAC (Serials Industry Systems Advisory Committee) is also looking into the delivery of table of contents information in machine readable form.
- A new "two-dimensional" bar code, developed by Symbol Technologies in New York, has been tested by Penguin and W. H. Smith in the UK. This code is able to store 100 times more information than the traditional ones. It is known as *PDF (Portable Data File) 417* and contains a built-in error correction. So even damaged or torn labels are read. An application in the book sector would be the use as outer-case label - if you look for a book you do not have to open the boxes but you just check the labels. A PDF 417 can encode almost 2,000 alpha-numeric or 3,000 numeric characters, and can be printed using conventional printers. A disadvantage is the current high price of PDF 417 scanners but new technology is often expensive at the beginning.[6]

These few remarks may show that standard numbering is a prerequisite for resource sharing in the book sector and an essential for improving the infrastructure of the booktrade, increasing performance and cost-efficiency. While seemingly a trivial technicality it has an enormous potential for saving staff and time, avoiding duplication of work and speeding up operations in the booktrade and in libraries.

International Standard Book Number (ISBN)

Application and Benefits of the ISBN

The ISBN may be used for manual as well as automated operations. It shows its full potential, however, in computerized applications.

Use in Publishing Houses

The ISBN serves as identification number for:

- publication projects, including all stages of internal processing until the book is printed,
- stock control,
- ordering,
- accounting and billing,
- handling of returns,
- *Books in Print*,
- teleordering.

Benefits to Publishers

- The use of the ISBN shows that it is a professional publication.
- The ISBN automatically leads to the listing of the publisher (with address and telecommunication numbers) in the *Publishers' International ISBN Directory*. This is a free advertisement and allows customers all over the world to contact the publisher directly.
- The ISBN permits the listing of a title in *Books in Print* publications. Books without ISBN cannot be included. As booksellers all over the world use *Books in Print* a publisher has much better export chances for his production when listed.
- Titles are often ordered by ISBN only - this saves time and prevents errors. It is not necessary to know the partner's language when conducting business by ISBN - numbers are international.
- Titles with ISBN allow faster processing in libraries. This also speeds up their appearance in catalogues, like the Library of Congress catalogues and the National Union catalogue. This is another free advertisement.
- The use of the ISBN within a firm is a major rationalizing factor - it saves a lot of time and copying data and avoids errors.
- The ISBN allows the establishment of a national *Books in Print* publication which is the condition for a comprehensive distribution system within a country. It offers a large amount of information even in remote areas and creates a demand for books.

Use in the Booktrade

The ISBN serves as identification number

- for ordering,
- for accounting and billing,
- and search key for information retrieval,
- for stock control,
- in electronic point-of-sale systems (EPOS),
- in bar coded form, especially as part of the EAN system (ISBN/Bookland EAN).

Benefits to the Booktrade

- The ISBN is the cheapest and most efficient way of transmitting orders. It saves copying bibliographic data, can easily be sent by telex or fax and provides unique identification.
- The ISBN allows easy handling. A computer can do most of the processing if an EAN bar code is used. At any rate, the booktrade can do without specialists as no knowledge of foreign scripts is necessary.
- The ISBN is indispensable for exports (see under publishers). Even vernacular publications have an export chance as the ISBN overcomes all language barriers within the trade.
- Stock control is made easy with the ISBN. The control numbers are printed already on the books!
- Accounting and billing is more efficient and less time-consuming as no bibliographic data are necessary.
- *Books in Print* allows fast reference and ordering. It is also essential for the building-up of an efficient distribution system within a country. If there is no *Books in Print* yet the ISBN is the necessary prerequisite for creating one.
- The electronic point-of-sale system relies on the EAN barcode (= prefix + ISBN) and registers sales, calculates the turnover and monitors stocks and necessary re-ordering.

Use in Libraries

The ISBN serves as identification number for

- ordering,
- information retrieval,
- selection and downloading of catalogue records,
- circulation and interlending,
- the national bibliography.

Benefits to Libraries

- The ISBN gives also libraries access to fast and efficient ordering systems.
- The ISBN allows selection and downloading of cataloguing records from bibliographic data pools (eg OCLC) and library networks.
- The ISBN provides easy access to many directories, national bibliographies, library catalogues, databases and bibliographic CD-ROM products.
- The ISBN may serve as the control number of the national bibliography, as in Thailand and Hungary.
- The ISBN is useful for interlibrary loan and circulation.

Focus on Libraries

The ISBN is generally used for the selection of cataloguing records from union catalogues and library networks. This is a fast and efficient way of doing retrospective cataloguing. Such a project has recently been undertaken by the Hessian Regional Library System (Frankfurt, Germany).[7]

Not so well known is the role of the ISBN in interlending. Some countries find their traditional card file union catalogues too time-consuming to handle and prefer using ISBN location registers. This is just a concordance between the ISBNs and the respective library symbols. Such lists can easily be compiled and either be kept online or distributed on microfiche. The ISBN is the link with the cataloguing record.

The use of the ISBN as a control number for the national bibliography has the advantage of having the numbers printed in and on the publications themselves. This facilitates searches and the selection of bibliographic records. On the other hand, this use of the ISBN leads to total numbering which is an ideal prerequisite for fast, efficient and comprehensive data management and bibliographic control.

The ISBN may also be used retrospectively. Some countries, especially smaller ones, are interested in covering their whole book production from the beginning of printing. In this case the ISBN would again be the ideal identification number for a cumulated bibliography even if the numbers are not printed in the books themselves. Currently Iran intends to number all publications edited after the Islamic revolution (about 200,000 titles). It would be an option also to use the ISBN (or a derivative) for large bibliographical enterprises like the *Eighteenth Century English Language Short Title Catalogue*. The best way of course, would be to adopt the ISBN as the general identification number for all modern publications and to run all library operations on it, from acquisition to cataloguing and to circulation.

Currently the IFLA Office in Boston Spa (UK) carries out a survey on the use of ISBN in libraries.

What has prevented librarians from making more use of the ISBN?

- When the ISBN system was started there were many publications without standard numbers. It was not worth while using the ISBN in libraries when perhaps only 30% of the acquisitions were covered. Now several countries get close to total numbering, and the acquisitions of many libraries are almost completely numbered. Even some of the world's largest academic libraries get close to a ratio 80 : 20.
- According to the needs of the trade different physical formats of the same publication receive different ISBNs. Readers, however, are usually interested in the contents only and would not mind a paperback edition if the hardback edition is not available. This drawback from the librarian's point of view is easily remedied in databases (library catalogues, *Books in Print*) where the ISBNs of different editions of a title may be linked. This linkage information is often already printed in the books.

The ISBN is not only an instrument of rationalization but also a means of building up an efficient booktrade and distribution system, including the necessary directories and data pools. Many people, especially small or occasional publishers, and sometimes also government publishers, are not aware of the importance and the potential of the ISBN. We librarians should therefore actively promote the ISBN system - this will be in our own best interest!

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The Philosophical and Practical Dimensions of Resource Sharing

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Abstract

Resource Sharing is not a new phenomenon among academic libraries. Within the academic community, libraries have taken a lead in forging collaborative partnerships with other institutions. Interlibrary lending and borrowing has long served the needs of faculty and students by dramatically expanding local collections. Scholars frequently travel to collections they need to consult and are given complete access to collections. Regional consortia whose purpose is to share collections abound in the United States. Nevertheless, resource sharing is receiving renewed attention for two reasons. First, the rapid progress in digitizing information promises to make resource sharing very, very easy technically. Second, the combination of the "electronic library" and increased resource sharing holds hope in some peoples' minds for a reduction in the rapidly escalating costs of operating academic libraries. Are these necessary outcomes of the electronic library? Will resource sharing be easier? Will costs moderate? This paper examines the technical and organizational issues surrounding resource sharing and attempts to answer these questions.

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1.0 Introduction

When I learned that resource sharing was to be the topic of the 16th International Essen Symposium, I was especially anxious to participate because resource sharing is a topic that has received considerable attention at Tufts University. Resource sharing is not a new phenomenon among academic libraries. Within the academic community libraries have taken a lead in forging collaborative partnerships with other institutions. Interlibrary lending and borrowing has long served the needs of faculty and students by dramatically expanding local collections. Scholars frequently travel to collections they need to consult and are given complete access to collections. Regional consortia whose purpose is to share collections abound in the United States. Nevertheless, resource sharing is receiving renewed attention for two reasons. First, the rapid progress in digitizing information promises to make resource sharing very, very easy technically. Second, the combination of the "electronic library" and increased resource sharing holds hope in some peoples' minds for a reduction in the rapidly escalating costs of operating academic libraries. Are these necessary outcomes of the electronic library? Will resource sharing be easier? Will costs moderate? This paper examines resource sharing within the contexts of Tufts University and some of the practical and philosophical issues of resource sharing.

1.1 The Tufts Context

The expectations of Tufts University have always exceeded the grasp of its libraries. By any measure, the Arts & Sciences Library does not compare favorably with the libraries of comparable institutions. In large measure this is the result of a de facto policy of relying on the library resources of other institutions of higher education in the Boston metropolitan area. Overtime, however, user dissatisfaction with the Arts & Sciences Library grew as the gap between it and libraries at other comparable institutions increased. Dissatisfaction reached such a point not long ago that the School of Arts & Sciences is making a concerted effort to reverse the trend. An addition doubling the size of the Library is scheduled to begin in the Summer of 1994 and the materials budget was increased by 17%.

Nevertheless, the degree to which the School of Arts & Sciences should rely upon the library resources at other academic institutions in the Boston area and the degree to which the emerging electronic library will foster increased resource sharing continues to be a major debate. Some members of the community believe that the electronic library is just around the corner so there is no need for a new building or increased funding. Others believe that the solution to the problems facing academic libraries lies in learning how to better share their resources. Some have argued that within the boundaries of the Boston metropolitan area are most, if not all, books ever published. Libraries need to learn how to share these resources more effectively. Still others, fervently believe that the scholarly monograph and journal will not materially change in the foreseeable future.

The range of views at Tufts mirrors the diversity of opinion on this topic throughout the United States. Why this renewed interest in resource sharing at this time? Two issues are driving this interest. First, electronic libraries are viewed as making resource sharing much easier than ever before. Turn on a machine, push a button, and the information, document, or image you need is available instantly. Second, electronic libraries are viewed by many as holding tremendous potential for reducing the costs of operating libraries. Are these assumptions true? Are these assumptions reasonable? Before examining these issues more fully, I must confess to a number of biases concerning resource sharing.

Resource sharing is not a new phenomenon. Indeed, libraries exist to share resources so that individuals don't have to develop their own collections. Academic libraries have traditionally shared their resources with faculty and students from other institutions in a number of ways. Interlibrary lending and borrowing has come to be expected by most users. Scholars who travel to remote collections are usually given access to the materials they need. Granted borrowing through interlibrary loans, through a regional consortia, or traveling to a remote collection requires more effort than checking and item out from one's local library. Nevertheless, these activities are possible because librarians have endeavored to use the available technology to make resource sharing as easy as possible. Users who complain that it should be even easier have unrealistic expectations and librarians should take pride and satisfaction in their accomplishments facilitating scholarship through resource sharing.

2.0 Practical Issues of Resource Sharing

2.1 Market Structure

Figure 1 is a very simplified illustration of the manner in which print resource sharing works now. Many copies of a work are purchased by a subset of libraries. Every user has access to the item either through his/her own library or through interlibrary loan.

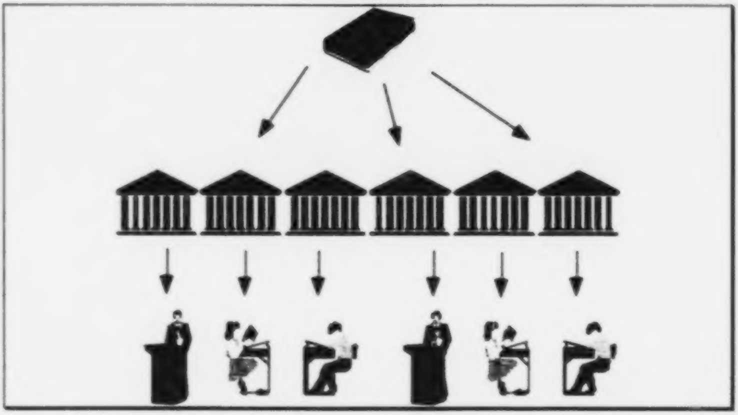

Figure 1
Simplified Model of Print Resource Sharing

There are a number of characteristics associated with this model of print resource sharing. Ownership, until very recently, has been the primary means of use. Second, resource sharing, again until very recently, has constituted a very small portion of library operations. Third, there is an established market for printed materials that is understood by producers - authors and publishers - distributors, and users - individuals and libraries. Fourth, producers, distributors, and libraries do not feel threatened.

Figure 2 is a simplified illustration of how electronic resource sharing might work based on the current Internet model. One copy, or a very small number of copies, of a document are stored digitally on a computer somewhere on a network. When a user identifies a desired document it is downloaded to a personal computer.

There are a number of characteristics associated with this model. First, access rather than ownership becomes the primary means of use. Second, there is as yet no established market for the distribution of electronic materials, especially over a network. Third, because there is no established market producers, distributors, and libraries feel vulnerable. If

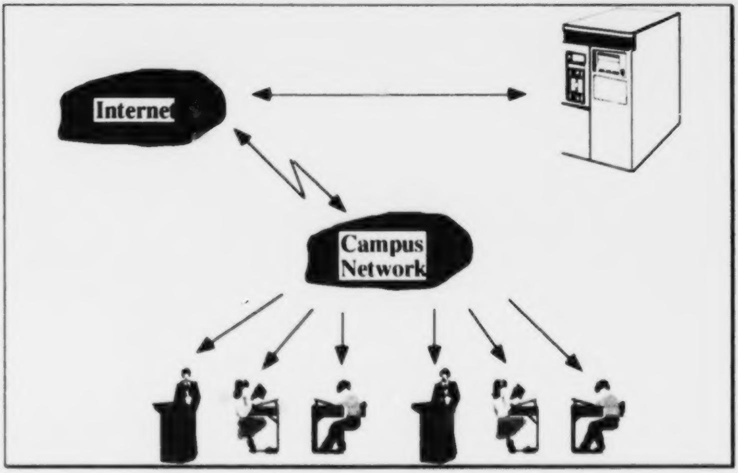

Figure 2
Simplified Model of Electronic Resource Sharing

electronic libraries and resource sharing are to evolve and flourish, it is clear that a new market structure will need to evolve also. I am confident that such structures will emerge as there are numerous groups wrestling with the issues. Nevertheless, the issues are not trivial. In a recent publication an attorney noted that:

> "Today, I will not know if a library user in Berkeley, in Boston, in Bonn, or in Brisbane is photocopying this article. But tomorrow ... when this article is available worldwide online, I will have the means to know who is reading the article on screen, who is downloading or printing out excerpts or complete copies ... I ... can condition online access to my article on compliance with whatever restrictions I wish to impose."[1]

Now this author was not advocating this approach, but was attempting to point out what could happen in the future. Clearly, the market structure will need to encourage scholarly communication while defining intellectual property laws that compensate authors and publishers.

2.2 Bibliographic Control

Let me turn now to the more familiar topic of bibliographic control. No! The cartoon in **figure 3** does not represent a cataloging backlog. The cartoon does represent what scholars would face in a world without bibliographic control. What does all this have to do with electronic libraries?

Figure 3

There are well established systems of bibliographic control in most developed countries for print works. As yet, however, there is no bibliographic control for digital documents. Trying to find something on the Internet is a little like drinking from a fire hose - there's a lot there, but getting a drink is hard. Well, on the Internet there's a lot there, but finding what you need is hard. We need tools that will automatically provide bibliographic control for digital documents. Such tools are beginning to emerge as evidenced by programs such as Gopher, Veronica, and Archie. True electronic libraries, however, will require more sophisticated tools to identify and retrieve desired documents.

2.3 Costs

The obvious question is, will electronic libraries cost less than print libraries? Many people seem to believe that the answer is a resounding yes! This view seems to predominate among technologists and academic administrators; the former, because they have an abiding faith the ability of technology to solve most, if not all, problems and the latter because they have a fervent hope that a magic solution to serious financial issues will materialize.

At this time we don't really know whether electronic libraries will cost less than print libraries. In fact, we don't yet know how to measure and compare the costs of print libraries and electronic libraries. In order to use electronic libraries, for example, users must have access to a personal computer and usually a network of some kind. Both the computer and the network can be used for a variety of tasks, in addition to connecting to electronic libraries. Should the capital and operating costs of the computer and network be included when comparing the costs of print libraries and electronic libraries?

If we don't know how to compare the cost of the two types of libraries, what do we know from the 20+ years libraries have been using automation. We know that automation does not reduce the absolute cost of operating libraries. We also know that automation can slow the growth of costs by processing more transactions with the same level of resources - by reducing the unit cost in other words. And we do know that the actual cost of electronic libraries will depend on the new market structure that emerges. Finally, the evolution of electronic libraries will likely take some time. During this evolutionary period print libraries will continue to play an important role in higher education. Most academic libraries, therefore, will need to operate both print and electronic libraries. Operating dual systems is always costly.

3.0 Organizational Issues

What causes an organization to share its resources? There are a number of answers to this question. An organization may feel that the benefits that accrue from sharing are worth the effort. Or an organization may feel that sharing is the only way to achieve a desired outcome. Sharing may be imposed by a higher authority. A government agency or a provost, for example, may impose sharing on libraries. And then there is altruism - sharing is the right thing to do.

Is motivation sufficient to bring about sharing? The answer is no! Two other factors must be present for sharing to take place. First, the players must be willing and able to look at issues from different views not just from their own interests. Second, there must be a sense of equity. This is an important component since no one likes to feel that they have been disadvantaged.

Equity does not require an absolute balance of trade. Rather equity usually implies a range. If transactions fall within the range participants usually feel that equity exists. If transactions fall outside the range then feelings of inequity usually develop. In essence, equity requires that no partner view themselves as losing or being disadvantaged by the relationship.

Equity is easiest to achieve among partners of similar means. In the United States we try not to think of academic institutions as competitors. But in fact, academic institutions compete for students, faculty, funding, and prestige. One of the ways that colleges and universities compete is through the resources they can offer - the libraries, computing facilities, recreational facilities, offices and labs. This raises a perplexing question, however. If a university has invested in its resources - including its libraries - in order to attract faculty, students, funding, and prestige, why should it share such resources with other institutions?

In the United States there is general agreement that resource sharing is critical for research and graduate education. This consensus is born from an understanding that no single institution - no matter how well off - can afford to support the breadth and depth of research faculty and graduate students undertake. There are mixed views, however, concerning resource sharing in support of undergraduate education. In general schools with weak libraries and/or vulnerable finances tend to favor resource sharing in support of undergraduate programs. Schools with strong libraries and/or strong finances tend to view resource sharing at the undergraduate level as reducing their competitiveness. If the sharing of digital documents - a necessary underpinning of the electronic library concept - is to become an ubiquitous reality the higher education industry in the United States will need to resolve the tension between competition and cooperation.

4.0 Conclusions

As we gaze into the future, what predictions can we make based on past experience and current trends? A number of issues quickly emerge from the crystal ball **(Figure 4)**.

- Technological advances will make it easier and easier to share information. The limiting factors will not be technological, but rather the ability of the market and organizational systems to keep pace with the technological advances.
- A market structure that accommodates electronic information has begun to evolve and its evolution will be critical to the development of the electronic library.

Figure 4

- The evolutionary scale will not be geological, but neither will it be quick.

- Disciplines will adapt differentially to electronic information.

- The higher education "industry" in the US must change in order to take full advantage of resource sharing. The industry must resolve the inherent conflict between the current climate of competition and the need for new levels of cooperation if the benefits of the electronic library are to be reaped.

- Librarians must redefine their business. As the electronic library evolves into a widespread reality, librarians must define meaningful roles. Two areas that librarians should focus on are (1) the design of automated bibliographic control systems for networked information and (2) the provision of training and support services for users of networked information.

- Academic libraries will likely be operating both "paper" and "electronic" libraries for some time because the electronic library will not immediately replace print collections.

- Little, if any, cost savings will be realized until the transition to the electronic library has significantly progressed.

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Recource Sharing in a Changing Library Environment : Strategies and Policies in a Canadian Research Library

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Abstract

Although resource sharing has existed for decades the concept has been significantly revitalized. Three reasons are proposed for this revitalization: the broadening of the concept of resource sharing; the revolution in information technology, in particular, the Internet; and the prospect of cost savings for beleaguered university budgets. Each of these factors is explored with reference to improved interlibrary loan practices, cooperative preservation programs and membership in collective groups such as the Research Libraries Group (RLG) and Center for Research Libraries (CRL), which extend access to scholarly information resources beyond the local institution. Resource sharing and information technology are viewed as inseparable in improving the information infrastructure on which the scholar and researcher depend.

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The idea of resource sharing, the commitment of libraries to share amongst each other their information resources, has existed for decades. Why then is this concept suddenly being revitalized, indeed becoming galvanizing to a host of librarians who have grown up with it? Three reasons:

I. The definition of resource sharing has been broadened. It includes in today's modern research library not only the sharing of materials through interlibrary loan, but also the sharing of expertise and the preservation of library materials.

II. Information technology has revolutionized libraries and has improved every aspect of resource sharing, from the delivery of library materials to the development of collective catalogues.

III. The prospect of improved resource sharing offers to senior administrators and research librarians the promise of relief for their beleaguered collections budget.

I want to explore each of these reasons (the broadening of the definition of resource sharing, the rapid development of information technology and the fiscal crisis in universities) within the context of resource sharing. I shall use examples from the McGill experience, but in each case, these examples are not unique. They represent the response of one institution to the changing information landscape.

Please bear with me during a brief description of the institutional environment at McGill University. Like most research universities with some longevity, McGill Libraries house unique collections and, at times, exhibit idiosyncrasies which stem from age and origin. McGill University began in the 1820s [not very old by European standards] as an anglophone institution in what is now a francophone province (Quebec) in a multicultural country (Canada).

The University's first faculty was the Faculty of Medicine, established as the first medical school in Canada, at a time when many North American physicians were being educated in Europe. The prominence of medicine at the University continues to the present. Education for other professions - law, medicine and engineering - continue as an important university priority. The University, at present, offers PhD degrees in 55 disciplines. This brief description suggests a traditional, conservative academic environment, and this picture was until fairly recently an accurate description.

Quebec has been in a state of rapid evolution since the early 1960s when the so called "Quiet Revolution" of the Liberals began to have an impact on the culture. The University like most universities throughout North America, adapted to the new and more open values of the 1960s, but this spirit of freedom was more deeply felt within Quebec as a language and cultural identity issue as well as a social intellectual movement. Today, it is not an exaggeration to say that Quebec holds the future of Canada.

In 1976, following the election of the Partie Quebeçois, the self-declared party of separation, thousands of English speaking Quebecers left the province. Since then McGill has been evolving and strengthening its role in a multicultural society. Increasingly, it looks to a French student body and to a growing international student population. Of the approximately 30,000 students enroled at the University, 20% come from outside the province and 10% from outside Canada. There are 128 different countries represented in the 3,200 foreign students. The University also continues to broaden its base of programs: the approximately 1500 professors are scattered throughout 110 departments with 7 schools and 12 faculties. Today, 20% of our students are francophone, where in 1965, only 5% were French speaking. The overall university budget for 1992 was more than 450 million dollars.

In such a multicultural, multidisciplinary environment, inter-reliance upon other institutions for research materials becomes a cornerstone of library planning. Resource sharing in the McGill environment becomes more complex as the University and its libraries seek to cooperate in a French-language culture while maintaining the University's distinctive, anglophone character. Resource sharing for McGill Libraries occurs in a series of concentric circles: within the Montreal community where 4 major universities (2 English and 2 French) are involved being at the hub, followed by the Quebec provincial network, then the national network, and, finally, cooperation within the North American research library setting.

I. The Expansion of the Definition of Resource Sharing

In its fullest definition, resource sharing includes both interlibrary loan and cooperative collection development and management. The former refers to the sharing of existing collections and the latter to future purchases of materials. Traditional nomenclature, "interlibrary loan" has broadened and is today more appropriately termed "document delivery" and linked to access services since the lending of original materials is increasingly being replaced by photocopy, telefacsimile, and digital delivery of documents.

The costs of interlibrary loan, the most well-developed and recognizable financial component of resource sharing, have been recently reviewed in a comprehensive study by the Association of Research Libraries and the

Research Library Group.[1] This study of practices in seventy-six US and Canadian research libraries collected cost data to assist research libraries in determining when their best choice was to buy and catalogue an item and when it was more cost-effective to borrow research materials. Other issues surrounding document delivery such as the use of fee-based suppliers or other libraries for obtaining photocopies of library materials were examined as well as the costs of staffing interlibrary loan operations. The principal findings of this study are not surprising:

- the greatest cost component was in the staffing of interlibrary loan operations, more than 75% of the unit cost per transaction, with less than 25% allocated to communications, photocopying, supplies, equipment and delivery;
- more than half of all filled interlibrary loan transactions are photocopies, not original titles;
- the average cost per transaction is approximately $30 (US), nearly $19 for the borrowing library and $11 for the lending library.

McGill University Libraries were one of the eight Canadian research libraries participating in this study, and the results of participation are helping us to look more critically at operations. McGill's major role is as a net lender, where we loaned 25,026 items to other institutions and borrowed 9,846 items (1991/92 data ARL). The interlending policies are determined by lending agreements within the province of Quebec and within the Canadian Association of Research Libraries (CARL), which coordinates interlibrary lending on a national basis. At McGill University, interlibrary loan activities are distributed throughout McGill's 18 libraries with the Humanities and Social Sciences Library providing the largest component of the borrowing activity and the Health Sciences Library the largest lending activity. McGill staff emphasize that the average cost of ILL activity is higher in the arts, humanities and social sciences disciplines. This perception was validated in the ARL/RLG study which noted that the "tendency exists toward lower unit cost as the rate of photocopy increases. And empirical evidence suggests that photocopy transactions are less expensive to process than transactions that require circulation record-keeping." (p.33)

In general, the arts and humanities disciplines borrow more books, microforms and obscure journal materials, as well as older and foreign language items. Net lending units are able to rely more heavily upon para-professionals and student assistants since the bulk of their work is in routine processing of requests for photocopies of journal articles, but the units in which borrowing is extensive require more advanced bibliographic and computer skills. McGill's unit costs for borrowing materials are significantly higher. The ARL/RLG average borrowing cost is $18.62 (US) or $21.50 (Canadian) and the lending average cost is $10.93 (US) or $12.62 (Canadian) for an average overall cost of $34.12 (Canadian) per transaction. McGill averages $46.44 (Canadian) for borrowing and $16.84 (Canadian) for lending. These comparative figures are somewhat misleading in that they relate to the interlibrary loan costs for the major research library in the humanities and social sciences. They do not include average cost figures for other libraries providing interlibrary loan, principally, the McGill Health Sciences Library where most of the activity is in the provision of photocopies of journal articles. This type of activity is less labour intensive and therefore less costly per transaction. McGill figures for the humanities and social sciences research library include 40% of transactions in photocopy in lieu of hard copy; the ARL Study averaged 64% of transactions in photocopy. This in part, but not entirely, explains McGill's higher costs.

What conclusions can be drawn from this study? To the layperson, the costs of borrowing and lending appear high, and McGill's figures especially so. The question we are asking ourselves is "Is this low or high with respect to what?" The answer is found in part by a recent study funded by the Andrew W. Mellon Foundation.[2] The purpose of this study was to describe the library landscape as it appears today, in its collecting, operating, financial and electronic dimensions. This study presents thoughtful, indepth information on rates of production and costs of scholarly materials and offers librarians an apparatus to assist in deciding when to buy and when to borrow. Parenthetically, I am tempted to add an unfair criticism of this otherwise outstanding study: it fails to comment on the historical context that at times results in idiosyncratic institutional behaviour. For example, although it may be more cost-effective to borrow rather than to buy a certain item, pride of ownership, combined with the existence of strong historic collections may result in a decision to purchase an item, even though borrowing may be the more cost-effective alternative.

In reviewing serial pricing, the Mellon study found that from 1963 to 1990, the price of periodicals increased at an average annual rate more than one and one-half times that of hard bound books - 11.3 percent per year for periodicals and 7.2 percent for books. (p.84) These figures take into account only US publications, and if foreign materials had been considered averages would be higher, especially as a result of the value of the US and Canadian dollars with respect to foreign currencies.

Regarding book price increases, the study documents far higher average price increases in books in science and technology which average an annual increase of 8.9 percent since 1978. The two fields with the greatest percentage increases in price, technology and medicine, were also increasing more rapidly in production. The average price per volume of hard bound books (1990) showed the highest percentage changes as follows:

MONOGRAPH PRICE INCREASES: MOST COSTLY DISCIPLINES

	CHANGE 1980-86	CHANGE 1986-90	AVERAGE PRICE, 1990
1. Technology	63.5 %	39.3 %	$76.61
2. Science	48.6 %	35.1 %	$75.20
3. Medicine	45.8 %	43 %	$71.87

[Mellon Study, p.88]

Periodical subscription prices are documented with equal thoroughness by discipline. Looking at the period 1982-1990:

PERIODICAL PRICE INCREASES: MOST COSTLY DISCIPLINES

FIELD	% CHANGE 1982 - 1990	AVERAGE PRICE 1990
Chemistry/Physics	131.9 %	$ 412.66
Math/Bot/Geol/General Science	113.9 %	$ 217.87
Medicine	111.8 %	$ 188.19

[Mellon Study, p. 90]

In contrast to the three most costly fields, the three fields exhibiting the lowest price increases were:

PERIODICAL PRICE INCREASES: LEAST COSTLY DISCIPLINES

FIELD	% CHANGE 1982 - 1990	AVERAGE PRICE 1990
History	74.3 %	$ 35.51
Philosophy/Religion	71.7%	$ 30.76
Literature/Language	58 %	$ 30.63

[Mellon Study, p. 90]

These data on price increases form a framework for deciding whether we should buy or borrow. To the purchasing price, the costs of acquiring and cataloguing an item need to be added. At McGill this averages $58 (Canadian) per item for cataloguing not including overhead such as housing and maintenance. If we consider the provision of photocopy rather than the borrowing/lending of original materials, the relevant comparison is between ordering a copy from a commercial document delivery service or another library. Other variables need to be considered here, including the frequency with which articles are requested from a particular journal and the speed in providing the information, to say nothing of the cost of the journal subscription. We recognize that this is not a simple equation, since we are dealing with indeterminate variables: the potential use of an item being the most significant one. The relative value of ownership of a book increases directly with its use, that is, the less the use, the greater the cost. The more times an item is used, the greater its value. An even more difficult variable is the value of an item to the advancement of scholarly research. Is, for example, the value of a book to a university scholar equal to the value of a reserve book for an undergraduate? In short, the quantifiable costs must be interpreted with common sense and good judgement.

We are taking into consideration costs and production figures as we develop strategies for information delivery. It is becoming clear that the major change in document delivery will be in the way we provide access to the journal literature, especially in the sciences. Publishers and librarians are equally involved in the transition to electronic text delivery to the end-user. The Red Sage project at the University of California at San Francisco and the Elsevier Tulip project serve as examples. We see the need to work increasingly closely with publishers to provide electronic text delivery. But we also are beginning efforts to work with faculty to develop agreements with publishers to provide for local use of materials, the journal in which the faculty member is publishing. The essential tension remains: publishers are still interested primarily in printing numerous copies at one time and selling them. Users are moving towards a model where fewer copies are printed and sold, and hard copies are reproduced on demand. A prediction on which we are basing our long range planning for the 1990s is that large print runs will disappear and hard copy will be on the demand of end-users. McGill University has made a commitment to the development of a fully networked campus and has invested heavily in information technology in the libraries for the past eight years. Our recent purchase of state-of-the-art bibliographic searching software has positioned the Library to move towards end-user searching and full-text delivery over the next three years. The transition

- from interlibrary loan costs to electronic text delivery - will not be easy or a monolithic one. Parallel processing will continue as we move into the next century.

I have emphasized that the definition of resource sharing has been greatly broadened and one of the most exciting areas in which cooperative resource sharing has advanced has been in the area of the preservation of library materials. In the fiscal year, 1990-91, ARL Libraries spent some $71 million dollars collectively on preservation. When dollars become this significant, individual institutions look to resource sharing activities as a means of maximizing on their investments, and in the past decade an increasing amount of attention has been directed towards preservation. C. Lee Jones, President of MAPS, The Micrographic Preservation Service, estimates that in the United States today more than 300 institutions have preservation programs in place, an increase of 600 % over 1986 programs.[3] Preservation programs have been broadened through the application of new technologies, especially digital ones, focusing not on the holdings of one institution but on a collective group of libraries. This is important in today's economy since no single institution can provide sufficient resources to preserve its entire collection. Activities such as digital scanning for preservation or deacidification processes are costly, with the latter only postponing the question of reformatting. Jones considers optical computing as the most interesting developing technology that will affect storage activities in libraries. He foresees a time in the near future when scholars and researchers will be able to scan microfilm onto a floppy disk and take it away to their personal workstation. However, these techniques which capture and preserve an image and, as an important by-product, solve space problems, are costly.

Most University libraries today have preservation librarians but not all have conservation laboratories. This is the case within McGill University although, thanks to granting agencies and the commitment to resource sharing, a preservation program is in place. The Canadian Cooperative Preservation Program enabled preservation microfilming of materials from six Canadian research libraries. A consortium of Canadian libraries successfully approached the Andrew J. Mellon Foundation for a grant which established the Canadian Cooperative Preservation Project. The grant of $ 875,000 was designed to fund the development of an infrastructure for preservation microfilming in Canada. Participating institutions accepted common standards for microfilming and the records of items preserved through microfilming at Universite Laval, the University of Alberta, the University of British Columbia, the University of Toronto, the National

Library of Canada and McGill University were created. Perhaps one of the most significant aspects of the project was the creation of a link to enable the transfer of records of materials preserved from the McGill database to the National Register of Microforms. This was a costly activity in terms of programming requirements, but it enabled the participating institution to transfer records from NOTIS-McGill to the National Library's host system where the collective registry is maintained. From this aspect of the project, McGill gained the technical ability to transfer full preservation records from its database to the National Register, a procedure and program that is now available to other NOTIS sites in Canada. In the process, staff developed knowledge and commitment to the project.[4]

The Canadian Cooperative Preservation Program under the Mellon funding concluded in June, 1993, but the preservation of materials under the project will continue. Basic costs for continuing the project, a technician's hourly rate of approximately $9.00 and filming of $0.62 per exposure have been confirmed and an operating budget has been established to provide for preservation microfilming of approximately 75 items per year.

In addition to resource sharing through interlibrary loan, document delivery and cooperation in preservation programs, resource sharing has become enhanced through collectives such as the Center for Research Libraries, and the Research Libraries Group. These collectives, formed and controlled by research library members extend to the scholarly community resources available, from the Vatican Archives to the University of Michigan in a network of online catalogue records and bibliographic databases. Over 20 million titles in 365 languages are available as well as manuscript resources via RLIN, the Research Library Information Network. Through participation the individual research library expands its institutional holdings far beyond the local availability of materials to enhance service to scholars. The founding members of the RLG (Columbia University, the New York Public Library, Stanford University and Yale University) conceived its mission: to enable research universities to work together to collect, preserve and provide the information required by the scholarly process. Through RLG's programs in collection development, preservation and resource sharing, facilitated by computer technology and telecommunications, the RLG is providing access to resources that would otherwise be unavailable. McGill University has also participated for a number of years in the Center for Research Libraries and has recently taken steps, along with many other libraries who are also Center members, to make its holding available through the local online catalogue at the University.

II. The Revolution in Information Technology

Just as the definition of resource sharing has broadened, advances in information technology (IT) are making resource sharing more effective. At times progress is so rapid both in IT and resource sharing that it is not possible to say which is cause and which is effect.

Without a doubt, the most revolutionary expansion of resource sharing for librarians, researchers and scholars has been through Internet. Internet refers specifically to developments that began in 1968 in the US Department of Defense Advanced Research Projects Agency Network (DARPANet). This network of universities, defense contractors and government researchers used the Transmission Control Protocol/Internet Protocol (TCP/IP) as a protocol for 'inter-networking', a term which refers to the ability of computers with different hardware configurations and different operating systems to talk to each other.[5] This network of thousands of computer networks, 'the NET,' comprises 1.7 million computers in more than 125 countries provides librarians with unparalleled access to information resources.

Today, according to Canada's national newspaper, the Globe and Mail, some 4 million scientists around the world are plugged into the Internet, gaining immediate access to the latest research. The Internet has revolutionized research and, by extension, the ways in which researchers access information. It has deconstructed traditional communications channels amongst scientists, one that was based upon a 'pecking order' and status in the scientific community, and has made research results available to all who can benefit from them. To quote the Globe and Mail: [Wed. June 16, 1993, p. A11]

> "This patchwork of electronic conduits can link a lone researcher sitting at a computer screen to distant experiments and supercomputers, to colleagues on faraway continents, to electronic mail, to mountains of data otherwise too expensive to tap, to large electronic meetings and work sessions, to bulletin boards where a posted query can prompt hundreds of replies and to electronic journals that disseminate findings far and wide. Moreover, all this can happen at rapid speed with a fraction of the cost of other types of communication. All it takes is a personal computer and a phone line."

A variety of 'tools' for negotiating the Internet and accessing resources world-wide have provided an overwhelming amount of information to the researcher. Just at a time when the word 'tool' was becoming obsolete in library jargon, computer and information scientists were adopting the terminology 'access tools' to describe this array of pointers and finders. The combination of access tools such as GOPHER and WAIS with telecommunications has made the scholar workstation a reality. WAIS, the Wide Area Information Server, has been described by its creator Brewster Kohle, as acting like a research librarian watching a client read, taking note of what is useful and setting this information aside for further reference. But using WAIS requires that the client knows where the information is, what server provides specific information. Gopher, the fortuitous rodent, allows clients to browse the Internet. Gopher now includes the records of the Library of Congress.

Through its investment in information technology, McGill University is positioned to take advantage of these developments. Gopher, originally developed at the University of Minnesota, provides a means of distributing information to the university community, and is being used as a document delivery system. Using menu-selection, gopher provides a distributed document search and retrieval system on the Internet. Gopher and server clients run at McGill on most standard platforms including DOS, UNIX and MacIntosh. McGill's root gopher server provides access to other McGill servers such as those maintained by the Computing Centre, the McGill Centre for Intelligent Machines, the Physics Department, the School of Architecture and the School of Computer Science. The library administration has made a conscious decision at this point to use InfoMcGill, the campus information system, for mounting files, in large measure for cost reasons, but we will be reviewing this in the near future. For example, a comprehensive listing of libraries, world-wide, that accept remote login may be found in McGill's InfoMcGill service.

The Librarian of the Physics Research Division, Super Conducting Super Collider Laboratory, Dallas, Texas, has described this computer-based resource most admirably:

> "The growing use of GOPHER and other access tools means that traffic on electronic networks will continue to climb exponentially... There is no accurate number of machines available over the global networks. One estimate... looked at major networks, BITNET, Usenet, FidoNet, the Internet... and devised a total of 1,626,585 computers... Gopher's ease of use and functionality will add to the number of clients and servers available and push these counts even higher. We are on the verge of realizing that some ancient predictions about computers will come true... Gopher makes information access more human by hiding the inhuman aspect of using a computer... Gopher has indeed created an information appliance..."[6]

The Internet and the various access tools that make available electronic resources have enriched the world of information available to librarians and researchers alike. At the same time, resource sharing through cooperative acquisition of databases has become a complicated issue. As research libraries have moved to acquire local versions of bibliographic databases (MEDLINE, PSYCINFO) through third party providers (NOTIS/MDAS, CD-Plus, BRS, etc.) licensing agreements have emerged as major stumbling blocks to the collective purchasing of these costly source files. Fees may be based upon the number of potential users, the number of simultaneous users or on a single, flat site license. As a result, implementation and access to these data sets via the Internet in consortial relationships is very variable. Full access to all users in a consortium may be contrary to a licensing agreement, but access that does not violate the agreement may be financially prohibitive. "In order to comply with the licensing agreement... many library systems need to make intelligent decisions about the origin of the terminal session before allowing access to certain databases. To complicate matters, many libraries must limit access to some databases while at the same time providing unlimited, open access to other databases on the same system."[7]

At McGill our MUSE Database, the McGill University Public Online Catalogue, using NOTIS software and running on the Computing Centre's IBM 3090-200E mainframe under CICS (Customer Information Control System), is accessible via the Internet. Approximately 1.5 million records are available, and some 3.6 million Muse searches are performed annually from within the libraries. In addition, some 900,000 are done from outside the library with almost 100,000 of these over the Internet. Recently, the McGill Libraries contracted with CD-Plus, Inc. to install multiple databases in a quasi-consortial relationship, and are experiencing the pangs of growth through data licensing.

III. Cost Savings through Resource Sharing

The expansion of resource sharing in the context of rapid developments in information technology presents to the beleaguered university administrator a bright future. Senior administrators look at the spiralling costs of materials and apply an exponential growth curve, envisioning a time when half the space in universities will be taken by libraries and the library will be able to afford only one journal!

Interlibrary loan will be endemic with only one electronic version of a journal (this is not as far away as it seems) in existence and researchers and scholars will access this at will from their workstations. All materials a scholar will ever hope to access will be in digitalized format (this is somewhat more remote). Unfortunately, the world is not moving quite so quickly. For example, Project Gutenberg, an American text project, converts books for free digital distribution, but so far fewer than 100 titles are available, although the projects' director estimates that 10,000 will be ready by the turn of the century. This does not hold much promise for the deficit ridden university.

Costs and accountability are being relocated within the University. The information and telecommunication infrastructure at McGill University is provided by the Computing Centre, and our library programs are reliant upon this development. But the costs of networking the campus are not borne by the Libraries. Similarly as we implement document on demand services, such as the Service 2000 program provided by the Canada Institute for Scientific and Technical Information, the cost of copies of journal articles are being passed on to end-users. As we move more fully towards end-user searching through the local availability of databases and full-text delivery, the user must have access to a workstation equipped to provide this capability as well as the necessary training to access information being delivered in this fashion.

The University is increasingly committed to equipping its community with hardware and a telecommunications infrastructure. Our most computer literate users are rephrasing an old adage to read: "An hour at the computer can save a month in the library" where they used to tell us that "an hour in the library can save a month in the laboratory."

In these developments, McGill University is characteristic of the North American university. As the University grapples with budget compression, the libraries are experiencing even greater pressure to share resources in cooperative programs with other institutions. In our rush to develop these programs, the needs of the user, the professor, researcher or student, are the fundamental concern. Library programs and plans have become more clearly defined through the development of Five-Year Plan for McGill University Libraries.[8] The cornerstone of these programs is the needs of the user. Without this anchor, program development becomes the slave of technological innovation, and the library lacks a clear vision of its role and services. We are trying to avoid the predicament of Alice in Wonderland who asked the Cheshire cat which way she ought to go. The cat replied that this was dependent on where she wanted to get to. "I don't much care where" said Alice. "Then it does not matter which way you go" said the Cheshire cat. The intelligent application of information technology in libraries requires continuing user dialogue if we are not to end up with Alice, "not knowing which way to go."

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The International Library Market for CD-ROM Publications

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Abstract

For centuries, readers and users of books, and even librarians, have complained that there is never any end to book production and that this causes not only extraordinary time problems, but space and organizational problems as well.

The first CD-ROM products came on the market in 1984, they were at first greeted with a great deal of scepticism, since experience had often enough proved that the announcement of video discs and similar systems, for whatever reasons, did not necessarily correspond to their practical success.

The decisive breakthrough in the library sector, though, was then achieved through the intensification of this technology by Bowker

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Publishers in New York, who published *Books in Print* on CD-ROM in 1985, at first as a trial, then as a series. This pioneering work was followed by *national Books in Print* for practically every other nation, and in the meantime, a large portion of the national bibliographies as well. Meanwhile, today's market consists of some 3,000 CD-ROM publications in print, which are oriented toward the information and library markets. In addition, a CD-ROM market for private customers has been developed, which particularly includes dictionaries, encyclopedias, travel guides, and the like. Numerous publications which were introduced as annual publications appeared for the last time in 1990 or 1991. Many titles which are listed in the directories of *CD-ROMs in print* were indeed announced for 1991 or 1992, but have not been published yet. There are renowned reference works which have sold less than 50 copies on CD-ROM, while the previously mentioned *Books in Print* has meanwhile reached a sold circulation of more than 5,000.

1. Developments since 1985

No other form of publication, nor area of publishing, has experienced such a rapid development on the international library market as have CD-ROM publications since 1985.

The first sample diskettes were presented in 1985. They contained comprehensive data stocks and could be accessed relatively easily. The first commercially used publications were published from 1986. One of the very first publications was *Books in Print*, the index of US books in print from Bowker Publishing. While microfiche and microfilm publications, for example, required decades to become somewhat accepted in libraries, CD-ROM publications often succeeded in becoming completely accepted within a matter of months. This development happened particularly quickly on the American and Canadian markets.

The developments began with due delay in Continental Europe, Great Britain, Australia and the remaining internationally relevant library markets. An additional and considerable delay occurred on the Japanese market, since it became evident very quickly that the CD-ROM publications (which were more or less internationally standardized) could not be played on Japanese PC equipment because the PC stations which were supplied to libraries in Japan were not internationally compatible, ie they were not IBM compatible. While the Japanese market otherwise frequently plays a pioneering role in information technology, one can observe a clear deficit here.

2. The Market Situation Today

At the moment there are at least three relatively dependable indexes of available CD-ROMs. The first is published in the US, the second in Great Britain, the third in Germany. All three indexes list approximately 3,000 titles which are supposedly available. Considerable care is thereby given. When one examines this information more closely, it turns out that at least 25% of the titles listed as available are actually not available. Some have yet to be published, others are no longer published, although they are indeed listed as "published annually", etc. Although one does come across titles in *Verzeichnis lieferbarer Bücher (VLB)* which are not in print, the percentage there is always considerably lower, hovering in the per thousand range.

The reason is that the market assessment of many editors and publishers for CD-ROM publications is still completely wrong. They announce titles and then expect to receive a large number of incoming orders within a relatively short period of time. The market information has been totally confused, because, for example, more than 6,000 copies of the American *Books in Print* have been sold; around 4,000 copies of *Verzeichnis lieferbarer Bücher*, the German Books in Print; and also more than 1,000 copies of a few other titles. In practice, however, this does not mean that each index which is offered on the market will automatically be accepted. On the contrary, a number of highly interesting, important (or at least supposedly important) publications sell less than one hundred copies. It thus happens that in many cases the publisher will decide not to publish the title despite its having been announced. Other titles may be published, only to be discontinued or accompanied by the remark "no longer published" after the first edition if they continue to be confronted with a low number of incoming orders.

The prices of CD-ROM publications range from DM 40 to DM 45,000. It is totally unclear here which criteria are used in calculating the price. In most cases, it seems that no system whatsoever exists, rather one attempts to set a price and tests whether the market accepts it. This means, for example, that there are publications which were originally announced at DM 5,000 and are now available at DM 600. The cost trend here is entirely different from book publications. While one must principally assume that decisive factors in the book production process (ie printing, binding and paper costs) will continue to rise, one observes a continual decrease in costs in electronic data processing technology. If one assumes that the production of a CD-ROM from an existing, electronically saved database cost between DM 150,000 and DM 200,000 two or three years ago, then this price would quite often be less than DM 100,000 today. However, one basic requirement here is that the data stock already exists in an electronically accessible and compatible form. This means, if a comprehensive bibliographical, lexigraphical or similar data stock first requires technical data processing work, then the costs can very quickly exceed DM 1 million.

For example, when K.G. Saur Publishing published an electronic version of the *Allgemeines Künstlerlexikon* from *Thieme-Becker*, which consisted of 43 volumes, the entire data stock first had to be digitalized and then coded. The costs incurred for this work, amounting to circa DM 750,000, could only be amortized in the very long term through the sale of the CD-ROM edition. When pricing a CD-ROM, it is absolutely decisive to consider the market to which the product is aimed. If the contents are adequate and one can hope for a correspondingly high frequency of use in large scientific libraries, then it is entirely possible to calculate in price categories of over DM 1,000.

On the other hand, when one is aiming at a private clientele, ie the private citizen interested in encyclopedias and information technology, then calculations of over DM 100 will hardly prevail on the market.

3. Main Focus of Content

It more or less goes without saying that the publications which will be published first and foremost in CD-ROM form are those which cover large data stocks. Such works include bibliographical indexes; biographical indexes; encyclopedias; Who's Whos and similar projects; telephone books;

address books of all varieties; statistical, encyclopedic works and similar publications.

As can be expected, the *Bible* has naturally long since been available on CD-ROM. However, this CD-ROM version is in no way appropriate as reading material. It proves to be most interesting when one wishes to check which words or phrases are used, how often they are used, etc. Up till now, however, the Bible sales on CD-ROM have been uncommonly low in number.

The *Oxford English Dictionary* from Oxford University Press in London is the first large encyclopedic dictionary to be published on CD-ROM which is accessible to both the international as well as the Japanese market. The development on the general lexica market will proceed rapidly, and this also the decisive starting point for publishing CD-ROMs which are geared to the general public and thereby go beyond the traditional library market. It is fundamentally decisive that the CD-ROM offers more advantages in content than the book edition. When one examines today's *Verzeichnis lieferbarer Bücher*, one finds that it is possible to search according to author, title, subject and keyword. With a great deal of effort, one could also previously ascertain publisher and title information from the ISBN number in the book edition. However, the effort involved here is extraordinarily high.

The CD-ROM offers all these search possibilities, as well as many others which go much further. On CD-ROM, I can search according to location of publisher, name of publisher, price category, and many other search criteria. The following is also decisive: The book edition is published once a year, while the CD-ROM edition of the *VLB* is now published nine times a year, and is thus kept much more up to date.

4. New Concepts for Publications

At the moment, the following publications exist on the international market: Bowker's *Books in Print* for the American market, *Whitaker's Books in Print* for the British market, K.G. Saur's *International Books in Print* (the index of English-language books in print not published in England or the US), as well as smaller indexes such as *Canadian Books in Print* or *Australian Books in Print*.

For the most part, these titles are also published on CD-ROM on different systems and must be purchased separately. The new technology has now made it possible to publish all five indexes on one single CD-ROM under the fitting name of *Global English-language Books in Print*, thus transferring the advantages of each individual version into a complete system.

The library user will now receive complete information on all English-language books in print world-wide. Additionally, one can find out other very important information such as price and edition of each title. This means, for example, that one can find out that a book is being offered in its third edition by German publishers, while in the US or UK it is being offered in its fourth or fifth edition. Surprisingly, one might also find that a title is being offered in the US for $100 and this same title is listed at £ 120 in London or at DM 280 in Hamburg. The uncommonly large memory capability of CD-ROM makes it possible to group comprehensive reference works of the most varied kinds completely onto one single CD-ROM and to provide access to all collected information in one form.

A similar publication would be conceivable, for example, for all national Who's Whos in the world or for biographical encyclopedias. Meanwhile, there have long been complete CD-ROMs for all telephone books for the whole of Germany. The development is naturally proceeding rapidly here as well and these kinds of reference works and industry directories will experience downright revolutionary changes in the coming years and will be simplified considerably.

5. Prospects for the Future

It thereby becomes clear that no other area of publishing will change so rapidly as the entire reference sector. This particularly holds true for library information. When one considers, for example, that in future the *British Library General Catalogue of Printed Books* will be available in two CD-ROM editions - it now exists in one alphabet to 1975 and then in various supplementary installments that meanwhile amount to seven further alphabets and consist of more than 600 volumes - then one can begin to fathom the enormous rationalization which is involved here, including savings in space and costs. The selling price of CD-ROM versions might be 20 to 25%

of the original price of the book version. The savings in space can hardly be estimated highly enough today. The overseas transport of a CD-ROM is possible by air mail at a low price within 3-4 days, while transport by ship previously required 6-8 weeks.

Updates can be carried out by uncommonly low costs. Concurrently, one can observe the trend that the CD-ROM is reaching an ever-growing private sales market. Comprehensive lexica, encyclopedias and multilingual dictionaries will likewise be increasingly offered in future in electronic form and will bring about a massive change in the market.

High Performance CD-ROM Network Computing*

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Gerold Ritter studied Technical Physics at the Technical University of Graz. He founded R + R Messtechnik und Handel GmbH in 1984; since 1990 he is involved in CD-ROM projects.

Abstract

More and more databases are published world-wide, year by year, to be used by professional and academic users in libraries and at the end user's workstation. A lot of these products are produced for the single user environment and not optimized for centralized or campus-wide usage. By understanding CD-ROM as data transport media we decided to develop a new generation of the servers that serve all these types of data and applications. We centralized and optimized hardware environment to perform faster access, simpler usage, and easier administration.

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* Paper not received in time due to extraordinary circumstances

Group on Electronic Document Interchange (GEDI) : International Co-operation for the Electronic Exchange of Documents

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David Buckle is Managing Director, OCLC International with responsibility for Europe, the Middle East and Africa. David has held this position for the past thirteen years. Before joining OCLC Europe David was initially Project Director, Birmingham Libraries Co-operative Mechanisation Project and subsequently the first Managing Director of BLCMP (Library Services) Limited, which he joined in 1970.

Abstract

While standards are usually formulated and approved through recognised national and international standards bodies, their application is usually stimulated by the prospect of reward which is sufficient to outweigh the cost of their implementation and application. The willingness to apply standards frequently depends on the popularity of their application. To pioneer their application requires either courage or a common pact between a number of significant players. The Group on Electronic Document Interchange (GEDI) falls into the latter category.

In describing the work of GEDI, I intend to quote extensively from the excellent statement of proposals of GEDI entitled: "*Electronic Document Delivery: towards further standardisation of international interchange*" *Version 1.0, September 1991*.

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The GEDI initiative was formalised at a meeting in October 1990 when a number of interested library related organisations met together and formulated the agenda for GEDI. The group was determined to be pragmatic from the outset establishing a limited agenda to achieve a defined set of goals within a period of twelve months. The statement of proposals was presented to a tutorial seminar of invited experts in Paris in September, 1991. The document presented to them defines a mutually accepted technical framework to facilitate electronic document interchange between the GEDI partners. All have a mutual interest in the electronic exchange of the full texts of documents. GEDI set out to define a framework which in essence is a defacto standard for electronic document interchange. The framework encompasses existing ISO open standards and related products which will facilitate compatibility and interoperability between the participants' library networks and in parallel offer greater functionality to their end users.

1. Networking

Before I address the particulars of my topic, let me first explore some pertinent aspects of the vehicle of electronic document interchange, the network. The topic of networking is not simply a fashion it reflects new opportunities stimulated by events. Earlier this year I attended Networkshop held at the University of Leeds. This is an annual event lead by the United Kingdom Joint Academic Network Team and attended by computer centre staff of academia. As one would expect the papers and discussions revolved around particular topics: wide area and local area network capacity, interconnectability, reliability, standards and protocols application, resilience, national and international co-operation, funding, security, and management being some of the primary topics. One particular paper given by Bob Cooper of the Joint Network Team illustrated the events that are paramount to realising the prospective opportunities that networking offer to the library community and which are being grasped by groups such as GEDI. The keywords are **fibre optics** and the **capacity** which that technology offers. We have entered the era of high performance broad bandwidth networking which will enable us to move from text/numeric data transmission to image based transmission which will encompass video and multimedia transmission. The prospect before that academic community in the United Kingdom is to move from a wide area network environment of 2Mbps capacity (JANET MKII) to an environment offering 622Mbps and rapid expansion to 2488Mbps (SUPER JANET) before the third quarter of the decade. In parallel local area networks will generally have capacity of 155Mbps. Such monumental growth does not simply offer opportunity to do contemporary things better, it creates a novel environment of opportunity for all professional and social policy-makers that have access to it and guardianship of it. This novel environment will span continents, particularly Europe, the Pacific rim and North America. To maximise the opportunity that this environment presents will demand change, particularly to the library and information professional's perspective of his/her environment, and the library and information suppliers perspective of his/her insularity in the market-place. What were once clearly defined professional demarcation lines will become blurred and what once was pride of commercial independence will become constructive interdependence. To example these comments let me draw from a report published in 1991 by the Research Libraries Group, Inc. and entitled Preferred Futures for Libraries: a summary of six workshops with university provosts and library directors, under the authorship of Richard M. Dougherty and Carol Hughes. Let me quote from the Introduction to the report:

> "A new era is now upon us. Information technologies are prompting new services, roles and relationships. The concept of the virtual library, i.e., a library that provides access to electronic and print materials from many sources, both local and remote, has achieved a widespread popularity. But the realization of the potential of the virtual library requires much more than changes in the operations within one individual library. As the academic community grows in dependence upon electronic publications and electronic bibliographic access, the interests and areas of expertise of the faculty, computing center, and research library become increasingly intertwined.
>
> Some librarians now see the need to re-evaluate the old model of self-sufficiency through centralized collections for which libraries serve primarily as caretakers and organizers. One oft-heard preference is for librarians to adopt a new role that includes the provision of customized information services as well as access to remote resources in many

> formats. If such roles were adopted, collaboration and co-ordination with other units across campus and outside the university community would be essential to success.
>
> The period of forthcoming change could be characterized as the transition from the physical library to the logical library. This simple phrase describes a fundamental change in library operations that will affect everyone from undergraduates to senior faculty. It will affect the way teaching and research are conducted."

While these are the comments of academic librarians, computer centre managers and administrators situated in North America, they demonstrate the impact of the new opportunities and challenges that are universal to the profession and which are not limited by geography.

2. New Opportunities

The challenges are multi-dimensional. The common cause to address these challenges is singular - collaboration. The participants in the workshops which addressed the "Preferred Futures for Libraries" were not of a singular profession, they acknowledged at the outset that their task was interdisciplinary. Service providers have also adopted the theme of collaboration, not because of its fashion but because of the obligation of interoperability demanded by users. Such interoperability demands the application and use of common standards. The adoption of standards by service suppliers is not simply to ensure survival, standards adoption offers new opportunities.

During the 1970s and 1980s service providers cherished their independence, in the 1990s service providers herald the virtue of co-operation: alliances are flourishing, so is co-operation in the application of standards. As you would expect it is not altruism it is pragmatism that is the glue of such co-operation. Taking OCLC as my example to demonstrate this point, alliances have been entered into with the American Association for the Advancement of Science (AAAS) to jointly develop a new venture in electronic publishing, "The Online Journal of Current Clinical Trials". In the field of resource sharing and document supply OCLC is working with UMI, The British Library Document Supply Centre and with ISI. In the realm of reference services and bibliographic record supply with a variety of service providers including The British Library National Bibliographic Service, BLCMP Library Services Limited, SLS (Information Systems) Limited in the United Kingdom, with Bibliotekstjänst AB (BTJ) in Scandinavia, the Ministry of Research and

Education in France, with UTLAS in Canada and Kinokuniya in Japan. All these examples demand the application of common standards, all realise mutual economic and service benefit to the service supplier and their end users.

3. Group on Electronic Document Interchange

While standards are usually formulated and approved through recognised national and international standards bodies, their application is usually stimulated by the prospect of reward which is sufficient to outweigh the cost of their implementation and application. The willingness to apply standards frequently depends on the popularity of their application. To pioneer their application requires either courage or a common pact between a number of significant players. The Group on Electronic Document Interchange (GEDI) falls into the latter category. The initiative in bringing GEDI into being was taken by Look Costers the Director of PICA the Dutch utility which serves the academic and public library communities of the Netherlands and those same communities in Northern Germany.

In describing the work of GEDI, I intend to refer to the excellent statement of proposals of the Group on Electronic Document Interchange (GEDI) entitled: "Electronic Document Delivery: towards further standardization of international interchange" Version 1.0, September 1991.

PICA's initiative was formalised at a meeting in October 1990 when a number of interested library related organisations met together and formulated the agenda for the Group on Electronic Document Interchange (GEDI). The group was determined to be pragmatic from the outset establishing a limited agenda to achieve a defined set of goals within a period of twelve months. Consequently the statement of proposals was presented to a tutorial seminar of invited experts in Paris in September, 1991. The document presented to them defines a mutually accepted technical framework to facilitate electronic document interchange between the GEDI partners. The partners included at that time:

The British Library Document Supply Centre (UK);
Ministére de l'Education Nationale, Sous-Direction des Bibliothéques (France);
Questel (France);
Télésystémes (France);
PICA Centrum voor Bibliotheckautomatisering (Netherlands);

Technische Informationsbibliothek (TIB) Hannover (Germany);
OCLC Online Computer Library Center Inc. (USA);
Research Libraries Group - RLG (USA).

All had mutual interest in the electronic exchange of the full texts of documents. GEDI set out to define a framework which in essence is a defacto standard for electronic document interchange. The framework encompasses existing ISO open standards and related products which will facilitate compatibility and interoperability between the participants' library networks and in parallel offer greater functionality to their end users.

During the period from October, 1990 through to August, 1991 members of the group met six times to review progress completing much of the detailed technical work by delegation to individual experts communicating through electronic mail.

4. The GEDI Service Model and Topology

As the name of the Group implies, its interest is in the interchange of documents in electronic form. Interchange is clearly only part of the process necessary to provide an electronic document delivery service. Consequently the Group limited itself to the definition of an electronic document format and the description of the interchange mechanism, the two essential components to realise electronic interchange. The Group acknowledged that the following elements are relevant to the complete delivery cycle of electronic document supply:

1. **Identifying and locating** - where the document is identified and the source location is established. This could be done through the use of online union catalogue access (for example using the ISO SR 10163 standard), or through offline services as CD-ROMs or paper catalogues.
2. **Ordering** - where the required document is requested for delivery. This is functionally identical with issuing an Interlibrary Loan request; with the active involvement of most of the GEDI members in ILL standardization and implementation projects, usage of the functional elements of the ISO ILL standard was considered to be advisable.
3. **Digitalization** - where a hard-copy document is transformed into an electronic image. This will be done through a scanning device.

4. **Interchange** - where the actual transfer of the electronic copy takes place.

5. **Hard-copy reproduction** - where the document's image is converted back to paper or other media. This will be done through a printing device.

6. **Billing, accounting and other administrative procedures** - all these elements can occur in several forms in practical situations; some might not be relevant in specific cases.

For GEDI **interchange** is the key element in this list as it facilitates the physical movement of a copy of a document. Other elements from the list could be absent in specific cases: identification and locating could be based upon common knowledge; ordering is not relevant in case of unsolicited delivery; digitalization is not necessary when documents have already been digitalised, either through direct electronic publishing or through scanning and storing; reproduction can be skipped when an electronic copy is to be kept on a storage medium; billing and accounting are not relevant in co-operative services where participants share load and costs between them.

The common model that forms the focus of the GEDI recommendations is centred within the **interchange** component of document delivery making it a universal model. The source information that GEDI is concerned with, document images, may be located around the world in various locations. Likewise, the target clients of document delivery services may be widely distributed. The model is therefore defined to accommodate all sources and targets.

Furthermore, the GEDI model recognizes the responsibilities of a wide variety of organizations involved in document delivery and their desire to implement private solutions. In general, private solutions reflect agreements that exist between groups of organizations to optimize services between them. The GEDI model is not designed to limit the possibilities and freedom of such agreements. In the end, the overall model aims at establishing common ground and direction guidelines for further development, to provide the possibility of interworking between different groups.

To illustrate the value of the approach taken by GEDI let me do so by illustration.

4.1. General Model - the Transaction

The general model for the interchange process for electronic document delivery is illustrated in **figure 1.** The main characteristics of the model can be described as follows:

a. the interchange involves two parties, the supplier and the consumer;

b. the supplier and consumer are linked through a facility enabling the transfer of an electronic document from supplier to consumer;

c. the transfer handles one document at a time.

The complete cycle of interchange, starting with an electronic document residing at the supplier and terminating with the completed delivery of that document to the consumer is called an **Electronic Document Interchange Transaction.**

It is important to note that the input and output functions as shown in **figure 1** do not participate in the transaction. The exact nature of these functions is not a concern to the GEDI agreements. Of course, in practical situations, some forms of input and output will be available: input can come from hard-copy documents through scanning (the most probable form in the short term), from files with stored document images, or from electronically published documents; output can take the form of inserting an electronic document into a storage file, or printing. The implementation of some of these options may be dependent on legal obligations and copyright.

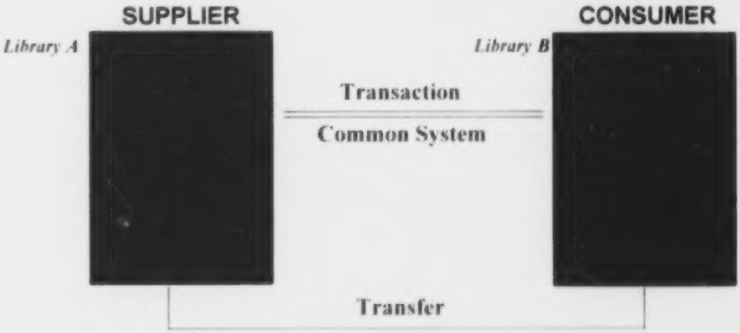

Figure1: General model for Document Delivery Interchange

4.2. The Domain and the Application Relay

A **domain** as illustrated in **figure 2** is defined as a group of one or more suppliers and one or more consumers capable of engaging in Electronic Document Interchange Transactions between them, where a common agreement exists in the following areas:

1. document compression algorithm;
2. document interchange format;
3. document transfer mechanism; and
4. network technology.

Such domain agreements not only specify which mechanism or standard to use, but also select the appropriate options to be used by the domain members. In this sense, the domain members agree on a common profile. This reduces the complexity of the development of systems that form part of the domain.

In practice, the domain agreements cover all communication layers, whether they conform to international or ISO standards and the ISO model or not. For example, the agreements in a particular domain might specify communication on the basis of File Transfer Protocol (FTP) over Transmission Control Program/Internet Protocol (TCP/IP); another domain might use ISO File Transfer, Access and Management (FTAM), Association Control Service Element (ACSE); Presentation Kernel, Session Kernel with full duplex, Transport Class 2 over X.25. With a domain, agreement on a profile covering all of the layers is required.

In the application layer, agreements on the document format are as important for the domain as the communication profile. In such a context, suppliers and consumers share the same view of an electronic document, and do not need functions for converting and reformatting.

Using this domain concept, it follows that a supplier and a consumer within the same domain are capable of interconnecting directly. Conversely, if they form part of different domains, they might not be able to do so, depending on whether the two domains share the same agreements or not.

If the two domains do not share the same agreements, the interconnection will be realized through an **Application Relay** function. The Application

Relay will receive an electronic document formatted and transferred under the agreements of the first domain, and will convert this information to a document formatted and transferred under the agreements of the second domain. **Figure 2** illustrates the role of the Application Relay.

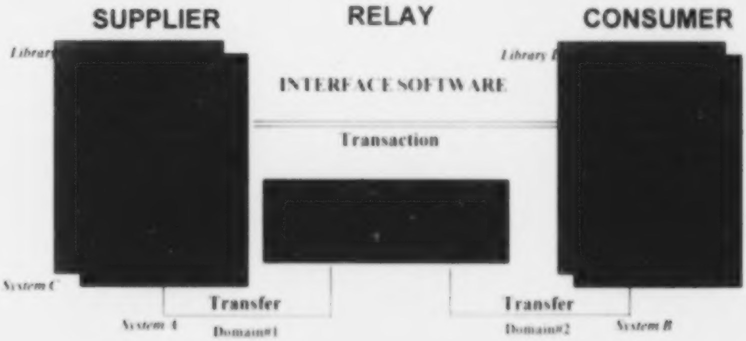

Figure 2: Interchange across two domains. (One on One Communication)

5. The GEDI Domain

This model described can be extended even further in cases where two domains do not share a common relay, but both have a relay to a third domain.

Figure 3 illustrates the communication between a supplier and a consumer that belong to two discrete uncommon (private) domains, using the services of two relays, and linked through the GEDI domain.

Within the GEDI domain documents will be exchanged in a format that consists of two parts: **cover information** and **document image.** By separating the cover information from the document image, relay systems are relieved of the requirement to be able to read the document image format. This approach also facilitates new document formats.

Documents in the **Document Interchange Format** can be transferred by a number of different mechanisms in different domains, initially a variety of file transfer protocols (eg FTAM, FTP) and later a variety of mail protocols (eg X.400). In the case of relays between domains, the Document Interchange Format may be transferred by several different mechanisms between the supplier and consumer in a single electronic document delivery transaction. Therefore, the Document Interchange Format must be relatively independent from the transfer mechanism and must not make many assumptions about the transfer mechanisms. It is assumed that the transfer mechanisms can handle 8-bit data and that they have error detection. Within the GEDI domain, some of the cover information may be redundant with information carried in the OSI FTAM, ACSE, and Presentation Protocols.

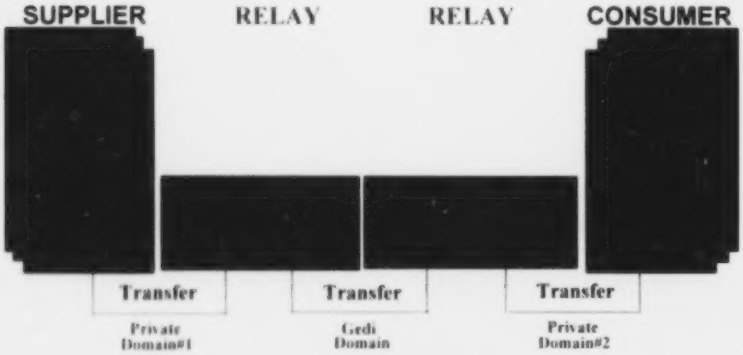

Figure 3: Communication through the GEDI domain. (Any on Any Communication)

In order to facilitate Electronic Document Delivery in association with Interlibrary Loan applications, information items are aligned with those defined in the ILL protocol standard, ISO 10161, wherever possible.

Initially GEDI will support the transfer of electronic document copies as scanned images. This is because the current requirement is to deal with printed materials. The Tag Image File Format (TIFF) was chosen because in the experience of the GEDI members it is most widely supported of the image formats that meet its requirements. The scanned image of the document will be transmitted in TIFF (Tag Image File Format) Specification Revision 5.0 for Class B (Appendix G:).

The current structure of the document interchange format is designed to accommodate easily additional formats for representation of documents, such as Open (Office) Document Architecture (ODA) or Standard Generalised Markup Language (SGML), in the future.

Each document is exchanged as a file between **Transmit** and **Receive.** GEDI seeks to support existing standards, protocols and profiles selected by existing standards groups for simple file transfers.

With regard to the first 3 OSI levels, the X.25 protocol, 1984 version, (Packet Switched Data Network) must be supported between GEDI Transmit and Receive. In regard to higher layers, Transport Class 2 and ACSE must also be supported.

Applications will be identified by unique Application Entity Titles (AET) using a registration procedure (ISO 9834).These unique names will be delivered by a GEDI Registration Authority, complying to the ISO procedure. This authority will be able to appoint other national authorities to deliver GEDI names.Access to the address of the named applications will be given through a directory function, not necessarily conforming to the OSI X.500 directory service.

In order to avoid potential conflicts, documents have to be exchanged with unique filenames. These filenames will be used continuously from supplier to consumer.

The transmitter shall be an FTAM client. It has to initiate the file transfer and send files. The receiver is an FTAM filestore. It has to listen to incoming calls and receive files.

GEDI members shall use the ISO 8571 File Transfer, Access, and Management (FTAM) Protocol File transfer class - with the write functional unit and the limited file management functional unit, according to a specified Implementation Profile.

This paper offers a glimpse at the GEDI framework and environment. For those with a thirst for more detailed knowledge, I commend them to the GEDI report. The GEDI concept is not unique, its definition and acceptance by a number of major utilities and document supply centres in North America and Europe is. The product of the GEDI group will form part of the foundation of the logical library and will facilitate access at the expense of ownership.

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New Ways for the Delivery of Information : IT, Networks, SGML, Multimedia and so on...*

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From 1994 he will lecture at the library school in Cologne (Fachhochschule fur Bibliotheks- und Dokumentationswesen in Koln) on the topic "information management".

Abstract

The latest news on electronic publishing and the delivery of electronic information in general will be presented. The presentation will provide a most actual overview of developments varying from publishing for and from networks, integrated information systems, electronic publishing, the "RedSage" and other projects, SGML versus Acrobat, to Nintendo and Multimedia.

In times of shrinking library budgets and a failing lobby for information, electronic publishing and digital libraries seem to be a solution, but very few hard facts are known and too many questions are unsolved.

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* Paper not received in time due to extraordinary circumstances

Retrospective Conversion of Catalogues in European Co-operative Systems

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Abstract

Co-operative cataloguing systems in Europe have not developed sufficiently to enable member libraries to carry out cost-effective, retrospective conversion projects because they still require all data-entry to be done online. The main issues that need to be considered are the avoidance of duplication of bibliographic records; maintaining co-operative standards of cataloguing; and the application of authority control. These can be addressed to enable the batch loading of records created externally to the database - thus providing a cost-effective conversion solution - through the use of long search-keys (matchcodes); modern database software; and the utilisation of specialised conversion skills as developed in SAZTEC.

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Introduction

I had the pleasure to meet with Dr Geh earlier this year on which occasion we discussed the possibility of the retrospective conversion of his library's collections.

Besides the problem of raising funds for such a project the main problem or challenge to the project as he saw it, was the fact that the library belongs to a cataloguing co-operative (the Süd-West Verbundsystem = South-West co-operative system) and that there would be difficulties in loading converted records into that database because of the need to avoid duplication and the need to ensure that any externally created records were compatible with the co-operatives' cataloguing rules.

This is not a unique problem as most German libraries belong to a Verbundsystem and many libraries in other countries belong to cataloguing co-operatives - co-operatives that often put up their hands and say in relation to a bulk retrospective conversion and loading of these records into the database - "no, you can't do that because how are we going to avoid duplication" and - "we need to maintain the integrity of the database and if we try and load records without the usual online checks we won't know if the records are up to standard" and - (the final riposte) "anyway, we haven't developed the software to enable this to be done so you can't do it and any such development would be too expensive and/or not a priority".

What I want to do in this paper is to examine these issues that are seen as particular problems for members of cataloguing co-operatives wishing to carry out Retcon of their collections; and to look at how these can be overcome - with a view to going back to Dr Geh and saying - "This is how I believe we can most cost-effectively overcome your particular problems - problems that are also the problems of many other libraries. If we now do a pilot/research project we may be able to develop a generic solution that can be applied to libraries throughout Europe" (which was really the gist of how I responded to him at our last meeting).

Firstly, however, I would like to preface everything else by saying that there are people in the library community and people here today that have a better understanding of the issues involved than I have - those people who run co-operatives for such as UTLAS and OCLC in North America; BLCMP in Britain; SIBIL in Switzerland and, of course, the "Verbundsysteme" in Germany for example (or even somebody involved in the DBI Retcon research project whose findings were not available to me before today). I would encourage you to stand up today and add anything relevant because this paper is, I hope, a beginning - a discussion paper that may grow into a real project with funding from the EC, the DFG or the like.

The main issue then, as I see it, is the integration of data created via a retrospective conversion project, outside of the existing co-operative catalogue, (ie not online to that system) into the existing system. At the simplest level this means

- avoiding **duplication** of bibliographic records.

And at a more complex, detailed level it means the compatibility of the records themselves with the

- existing **cataloguing** standards and rules and
- existing **authority** headings.

And I am going therefore to look at the issues under these three headings:

- **Duplication**
- **Cataloguing Standards**
- **Authority Control**

although the ways to approach these are not mutually exclusive as will become evident.

Duplication

The issue of duplication is self-explanatory, ie the requirement is to avoid having more than one copy of a particular bibliographic record in a database at any one given time. Of any work that has been done on this topic most of it seems to have been done in this particular area not only because that its the first step that needs to be carried out (ie before a record is assessed for quality it needs to be checked against the database for possible duplicates) but also because of the leadership (and need) of commercial organisations such as the database vendors in this area (whose work I will focus on as examples).

The checking for duplicates can be done in two ways, ie online and offline. By **online access** I mean through direct connection to the actual databases, in-house searching of CD-ROM, or getting the vendor to search online for you (the latter probably being the most expensive method).

By offline I mean a **batch access** method, where a search-key is created for a record and this is sent on a tape to the database which runs the tape in batch or offline mode to check for duplicates.

Online is the traditional, slower, expensive way of checking for duplicates while at the same time checking cataloguing and authority records and then adding local data. It's the same method that is used for current cataloguing and it's the way all or most co-operatives work. However, it is not the way, I believe, to provide Dr Geh with an accurate and cost-effective method to achieve the retrospective conversion of his catalogues. We need to cut out the step of online checking of every record and evolve a batch (offline) process that works and this is really the issue I wish to discuss here today.

As a lead-in to this I should say that SAZTEC's experience has not been with adding records to co-operative systems but rather in extracting records from large databases. The rules, I believe, are the same however as I hope to show.

What SAZTEC does as part of its conversion services is to search on large databases for records that match a particular bibliographic record. To keep expense to a minimum and still achieve high accuracy and high hit rates SAZTEC uses search-keys in a batch mode, (ie taking parts of the bibliographic record to form the key or matchcode), sending a magnetic tape or diskette to the vendor database for them to run that tape offline and find any matching records.

The important part is that the batch search-key concept can also be used by co-operative systems to initially check for the presence of a matching or a duplicate record for contributing to as well as taking from the system.

The first and main aim of the "search-key" is - as cost-effectively as possible, through a minimal amount of data input, using a minimal amount of staff time - to detect if there is a bibliographic record on the database that matches the catalogue record already in the library's own catalogue. If there is a match (a duplicate) then the contributing library should be able to add its local information to that record as quickly, simply and cost-effectively as possible and then be able to download a copy of that record onto its own local database if it has one.

Various search-keys have been used for checking for duplicate records. The most obvious are numeric keys eg

- ISBN
- LC Number
- National Bibliography or Cataloguing Number etc.

These are generally unique and, in the case of the ISBN, have been widely used since the late sixties. It is relatively easy to create a tape of ISBNs with other data if required (eg the Deutsche Bibliothek requests the date of publication as well if you are sending a tape in batch mode).

The problem for Retcon is that these days, more and more Retcon projects are aimed at those collections pre 1970 (as local automation often started at that point) and these records don't have ISBNs or other national or universal numeric keys.

The search-key then, if not a unique numeric key, is an alphanumeric key that has less chance of being unique. And there are a variety of such keys that have been and still are used. For example:

a) the pretty well-known OCLC batch search-key used for their TapeCon or Microcon products is basically a 4/4/4 key comprising the
   - 1st 4 significant letters of the author's surname
   - 1st 4 significant letters of the first significant word of the title
   - Date of publication

b) the ISM (formerly UTLAS) TPD (Title, Place, Date) key which comprises
   - Title - 25 characters (approximately)
   - Place
   - Date of publication - 4 characters

(OCLC also has a title key constructed on a 3/2/2/1 basis from the first significant word in the title and the three subsequent words.)

c) the ISM "full" search-key which basically uses as much of the bibliographic record as you like and which SAZTEC uses as follows:

   Author (1xx) - 1st surname plus initials
   Title (24x) - complete $a
   Place (260)
   Date (260)
   Added Author (7xx) - if required.

This latter key has proved much more satisfactory as a search tool, but would seem to some extent, to defeat the purpose of the cheaper, briefer approach as it involves more key boarding.

The other key I've chosen to mention is that used by the University of Bradford in its QUALCAT project where they used a fixed length code of 15 characters made up of the elements representing the

- Date
- Volume or Part
- Edition
- Author
- Title.

While the other keys seem relatively straight forward to understand this key is computer generated (thus requiring the full data in the first place) with the elements representing the above fields. I don't know how they are generated only that "the title and author elements of the code use techniques based on least frequently occurring characters"! (Ours is not to reason why, ours is but ... to see if it works.)

In the case of this research, they do not comment on the efficiency of the search-key so we don't know if it missed records or not. I am therefore not going to comment any further on it now except to say that it is another possible approach - an approach, however, that could be used in the retrospective conversion context more as a database maintenance program (which is probably its intention anyway). I will return to this later.

In SAZTEC's experience the shorter keys such as the ISM TPD and the OCLC key are only satisfactory to a limited extent. They have obvious shortcomings and the chances of picking up multiple hits or partial hits, are higher.

On the other hand, the longer the key, the higher the likelihood of accuracy. For example, recent SAZTEC projects with ISM where we have used their TPD and then applied the longer key, hit rates have improved by at least 15-20%. The penalty for this accuracy is that it requires extra work so it will cost more. The use of the longer key, therefore, will require the use of a data capture organisation providing high speed keying otherwise it will prove much too expensive for the library itself. There are also likely to be system penalties in that a long search statement requires much more processing time and resource.

With the UTLAS key we have looked for exact matches only. Any records that were not exact author and title matches were discarded. Any records with different 260 - data (date, place and publisher) are called partial hits and a separate report is produced. But this report is minimal in relation to the multiple hits reports the shorter search-key produces and to have to examine and check a large number of records to see if they match or not involve the library in considerable additional work (work that is undesirable).

So, in terms of using search-keys to identify duplicate records, there is quite a bit of experience to draw upon. SAZTEC's feeling is that, while initially a little bit more expensive in terms of data capture (because of the number of characters per record), the longer a search-key is the more likely it is to result in identifying if there is a match on the host database and the more cost-effective this is likely to be in the long-run. And, importantly, now that the software and system capabilities are there to use the longer search-key in a constructive way (unfortunately, most of the software on "Verbundsysteme" and vendor database systems was developed before the availability of the current generation of powerful databases) these can also be used to address to some extent the issues of cataloguing and authority control.

Cataloguing Standards

The issue regarding cataloguing rules and standards, based on the information I have, is that the co-operative is looking (and rightly so) to maintain a minimum standard of cataloguing which basically means a minimum level of bibliographic description. For example, SIBIL in Switzerland has an online checking procedure to ensure that a record meets such a minimal level of bibliographic description before it can be entered into the database. This involves, essentially, a program checking for the presence of certain fields and sub-fields in a record. And this is common across co-operatives. The CATSS (ISM) software does this also, checking by computer processing that certain fields (both fixed and variable fields) are present.

Let us say, for arguments sake, that these fields are:

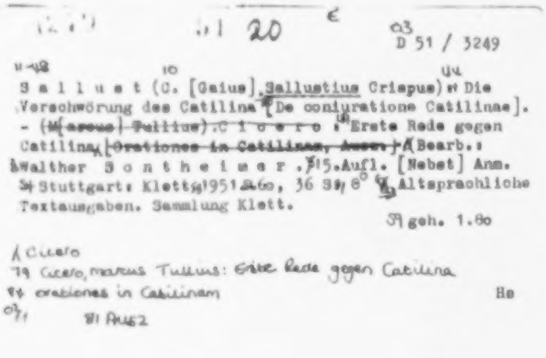
008 - Leader information
090 - Shelf mark
1xx or 7xx - Author or added author
245 - Title
260 - Publisher, place, date.

If this is all the co-operative requires, then this can be checked very simply by software in batch mode as part of the loading procedure.

What such software cannot check for, however, is differences in cataloguing practice or the application of rules, (particularly different generations of rules) and this affects both the duplicate checking procedure as well as the issue of maintaining cataloguing standards. For example, in a German library the source records may well be (and often are) catalogued according to Prussian Instructions (PI) while the records in the database (the Verbund) may well have been (probably are) in RAK.

RAK is basically an ISBD format providing a fixed order for the data in a catalogue record - title, subtitle, statement of responsibility, etc - and standardised introductory and separating punctuation (eg a parallel title is always introduced by an equals sign, a subtitle by a colon, etc).

Cataloguing according to Prussian Instructions, however, involves, to the untrained eye at least, no standard patterns either in the order of the data or in the punctuation - the title page of the book is simply copied. In the Deutsche Bibliothek project currently being undertaken by SAZTEC, the library wants, wherever possible, to upgrade the PI records into a RAK format to enable them to provide as consistent a national database as possible. This, to some extent, involves SAZTEC in recataloguing and at least, for example on this card, in significant interpretation. That is, it is up to a SAZTEC coder to decide, by interpretation and by following the clues provided by underlining and spacing on the card (eg the main filing word of the title is usually underlined), whether the data following the title proper is a subtitle (tag 45), a statement of responsibility (tag 48), the title of a second work (tag 49) or a contents note (tag 71), or whatever. In fact, on this card the title proper is followed by a uniform title (tag 70) and then the title of a second work (tag 49).



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The relevance of this to the content of this paper is that SAZTEC has developed an expertise that can be used to overcome the problem of records created outside the co-operatives not meeting the required standards.

That is, if this record was captured, (as is), as a search-key, chances of matching against a duplicate record may be difficult, particularly as some data is presented in a different order to RAK (some data may even be missing). If the record was to be captured in full, as on the original card, it would probably also not fit with local cataloguing rules. The only way such possible discrepancies can be overcome - be it completely or partially - is through exactly the approach SAZTEC has taken with the Deutsche Bibliothek ie having personnel skilled in PI to RAK interpretation (preferably not librarians as this increases costs unnecessarily) creating the search-keys and/or full records according to a strict specification, and manipulating data as much as possible in line with current cataloguing practice.

Authority Control

The use of such skills should also be important in resolving the next set of problems, closely linked to the cataloguing ones, namely those of authority control. The challenge here is that the heading in the record, particularly author and corporate author, may well be different to that used in the database or buried somewhere in the record and not immediately obvious, therefore, either missing a duplicate in the search-key/duplicate checking process, or having a duplicate record created and this not being discovered later.

This should be able to be overcome applying all or parts of the following:

(I) The application of conversion expertise at search-key and record creation time. As noted earlier, SAZTEC has developed expertise in dealing with PI material in the Deutsche Bibliothek and the Staatsbibliothek zu Berlin projects. It is possible for us to create a heading from a name entry that may not have been entered as a heading (eg under PI corporate authors often only appeared as statements of responsibility and not as main headings). This would help address the problem of different or missing headings to some extent, particularly if done with the assistance of appropriate lists or authority files supplied by the library to SAZTEC.

(II) Checking records in batch mode against existing authority files, prior to matching, to ensure as much standardisation as possible at this stage. ISM who are well known for their expertise with authority records, normally do authority checking as a post-processing exercise. But I believe there is also the capability for old and converted records to be checked against their thesaurus files which have been designed specifically to deal with older headings. For example, records using "US", "Gt Brit" or "Desc and Travel" will have the headings immediately expanded to their full form. Or, for example, for LCSH users, changes can be automatically applied as shown.

Old Form	**New Form**
The West	West (US)
Charts, tables etc	Charts, diagrams etc
Contract Services	Contracting out

This is the sort of authority control that would need to be done prior to checking for matching records on the co-operative catalogue. (Interestingly enough for the Deutsche Bibliothek project, SAZTEC expands abbreviations in records (particularly in series statements and corporate names) where possible, using similar methods.)

ISM also inform me that these capabilities can be used against a variety of bibliographic fields and in different languages. They currently have Japanese/English, English/French (Lavall not Rameau) and English/Chinese capabilities. I can see such facilities being very useful in the European environment.

(III) Post-processing of loaded records against authority files.

The third way to overcome some of the authority control problems is through post-processing of loaded records against authority files in a similar way as described for (II) above.

This could catch some records that are duplicates but that only emerge as such because they have data in the full record that is not in the search-key. To check that these really are duplicates a report would need to be produced and manually proof read, unless a duplicate processing program (like that used by Bradford University in the QUALCAT program) could be applied at this stage. That is, I have been discussing the use of search-keys to avoid the creation and loading of duplicate records onto a database. The Bradford research, however, was designed to detect duplicate records already contained within one database and the program developed checked on the basis of the main data fields in the record (245.100 and 700 fields in UK MARC). The two points that stand out for me in this research are that:

- such programs would be ideal as a post-processing check for records loaded into a co-operative, and
- the matching method chosen and the data fields used confirms that the use of the long search-key, focusing on key bibliographic fields, is the best way to proceed.

Before wrapping up, let me make one final comment on authority headings. There are many systems still without authority files that would probably respond to the above proposals by saying there is no authority file, therefore the checking must be done online. I would disagree. Through applying just the first method I spoke of in this context, ie using a skilled agency and by providing them with lists of headings that can be used for checking, then many of the cases should be able to be addressed.

Conclusion

Co-operative systems in Europe, in general, have not addressed the problem of helping libraries retrospectively convert their collections in a cost-effective manner because they have not developed facilities for batch search-key processing (to detect duplicates or matches) and for the batch loading of other records. Why not? I suggest this is because of the following factors:

1) **Fear of Losing Control**

Fear of losing control of bibliographic standards in the database thus creating a general attitude of resistance within the co-operative towards any developments that would enable anything other than all transactions being carried out completely online.

2) **Older Generation Systems**

They often have "older" generation computing systems that are either not capable of doing the necessary tasks or, at least, would require enormous amounts of development to do so, eg SIBIL in Switzerland and BIBOS in Austria stick out as two such computer dinosaurs and I'm sure many "Verbundsysteme" in Germany would fit this description.

3) **Low Priority**

Retrospective conversion, particularly in bulk, is not a priority. Current cataloguing comes first.

4) **Lack of Authority Control**

There are often no authority files which reinforces the attitude that authority checking can only be done online.

5) **Lack of Funding**

Co-operatives on the whole are poorly funded and what funds they do have tend to be diverted elsewhere - not to Retcon issues because they are not a priority.

6) **No Appropriate Research**

There has been no appropriate research to show a possible way ahead and overcome resistance from the co-operatives; a resistance which blocks any progress regarding the other factors.

To show a way forward I suggest that a pilot project needs to be carried out to test the hypothesis that I've been getting to in this paper which is:

- through using a long search-key based on key bibliographic fields, eg 1xx and/or 7xx, 245, 260. A search-key that should match the co-operatives minimum cataloguing standard,
- in conjunction with some "clever" modern, portable database software on, or running alongside, the host (co-operative) system and
- utilising specialist Retcon skills such as those of SAZTEC, to manipulate bibliographic and authority data in line with the rules of the host system

that through this will emerge a solution for enabling bulk retrospective conversion on co-operative systems, overcoming the perceived problems of duplication, cataloguing standards and authority control and thus enabling the conversion of some very important collections to be undertaken rapidly and cost-effectively to the mutual satisfaction of the library and the co-operatives.

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Fuzzy Logic : Is it a Better Bibliographic Retrieval Method for End-users?

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From 1979 to 1985 Peter Ahrens performed university and medical school studies in Cologne, London and at the Boston Harvard Medical School. Subsequently he worked as practicing doctor at the university clinics of Cologne, besides treating patients and training students he was responsible for computer systems in the hospital.

In 1987 he founded the software company NOVA IDEA Medical Informationsystems. As European partner of the American software company ARIES Systems Corporation, NOVA IDEA consults and provides optimized MEDLINE retrieval systems and other specialized software to libraries in health sector, pharmaceutical industry, research institutions as well as hospitals and medical doctors.

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Abstract

The results of a systematic comparative self-rating study at the Central Medical Library of the Medizinische Hochschule Hannover during summer 1993 are presented. Every CD-ROM user was given the possibility to search in MEDLINE using a new retrieval system enhanced with Fuzzy Logic components (Knowledge Finder)

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alternatively to the previously used retrieval system which was more based on the traditional Boolean search logic functionalities (SilverPlatter).

In a users questionnaire the rated performance by result quality, speed, and easy use of Knowledge Finder (KF) in comparison with SilverPlatter (SP) was tested. KF retrieved more relevant and subjectively better articles in 55 %, performed equally in 29 %, and found fewer and less relevant articles in 10 % of all cases according to users' self-assessment. The entire time needed to perform a search and select the relevant article for output was judged faster with KF in 80 %, equally fast in 14 % and slower in 4 %. The easy use of the graphical interface of KF was found optimal or at least logic in 78 % and complex or confusing in 14 % of all cases.

These selected preliminary results of the Hannover survey seem to confirm comparative American studies with different MEDLINE retrieval systems at medical universities and hospital libraries.

Possible reasons for these considerable differences in retrieving the same database with different approaches are discussed.

Introduction

Large bibliographic databases like MEDLINE become more and more readily available online, across networks and via CD-ROM not only for professional searchers but also for a rapidly growing community of library end-users.[1] Thus, today, many searches are performed by people who have very different degrees of knowledge about retrieval, especially true when dealing with bibliographic database design, retrieval languages, catalog systems or the construction, scope, use and limits of complex thesauri.

We were interested in learning more about how these differences and new retrieval system features are affecting end-user bibliographic database searching in the following major areas:

End-user methodical retrieval knowledge

What is the average degree of methodical retrieval knowledge that end-users of a university library in Germany have today? Are there differences between the three major end-user groups of a typical medical library (students, clinicians and scientists)?

End-user ratings of retrieval systems

How do end-users rate performance of a "fuzzy" ie "non-Boolean" enhanced retrieval system subjectively in terms of speed as well as result quality/quantity compared to a conventional "Boolean" retrieval system? Are there differences in the rating between the major end-user groups?

End-user benefits

If there are benefits to end-users from "fuzzy" enhancements retrieval systems, do these benefits differ for novice users, average users and experienced users?

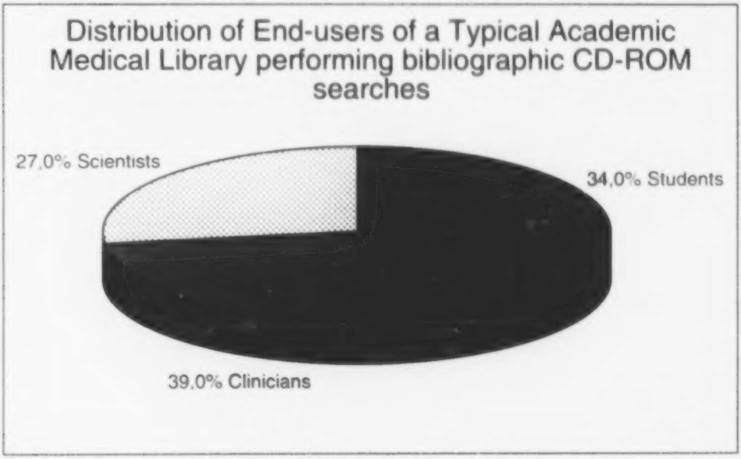

Figure 1:
Relative distribution of the three end-users classes students, clinicians and scientists participating at the self-rating study comparing "fuzzy" versus "Boolean" CD-ROM bibliographic retrieval of MEDLINE

Method

We carried out a systematic survey of end-users at the Central Medical Library of the Medizinische Hochschule Hannover during summer 1993. Every library user who wanted to perform a bibliographic database search on MEDLINE (CD-ROM) was given the possibility to search MEDLINE using a new retrieval system enhanced with some non-Boolean and Fuzzy Logic components (Knowledge Finder from ARIES) or to search on another retrieval system with the traditional Boolean search logic functionalities (SPIRS from SilverPlatter). A total of 92 users took part in the study, 31 of them were students, 36 clinicians and 25 scientists (**Figure 1**). Further descriptions of the new search techniques, their theoretical backgrounds and concepts are given in several other publications.[1 2]

Almost all users already knew the "Boolean" retrieval system well, which had been available in the library for years. For this study the end-users were only briefly familiarized with the new "fuzzy" system: They had access to a ten page brochure introducing them to the new software and the online help function offered by the software. Furthermore, the library offered introductory courses of two hours once a week; the training, however, was noncompulsory and only taken by about half of the participants in this study. Unfortunately we did not record who was trained and who not.

In a questionnaire developed by the library users self-rated their knowledge and system performance in various dimensions.

Results

End-users self-rating was obtained for three major methodical fields affecting retrieval in bibliographic databases like MEDLINE.

They were asked about their knowledge of Boolean logic (**Figure 2**). Overall less than 30% of the end-users asked said they really knew what Boolean logic meant. Almost 40% did not know what Boolean logic is, this deficit being highest among students.

End-user knowledge of 'truncation' is depicted in **figure 3**. 60% of all users said, they did not know what 'truncation' means. Again the student user class had the least knowledge of this technique (about 65%) closely followed by clinicians. Scientists more often knew what truncation means, still more than 50% said they did not.

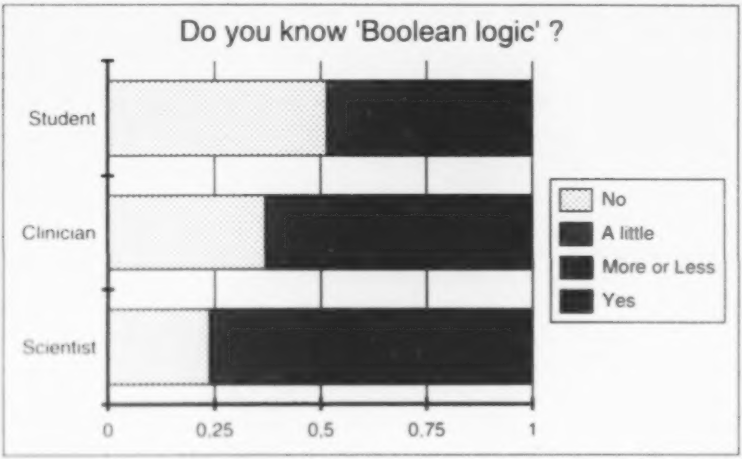

Figure 2:
Self-rating of end-users knowledge about Boolean logic

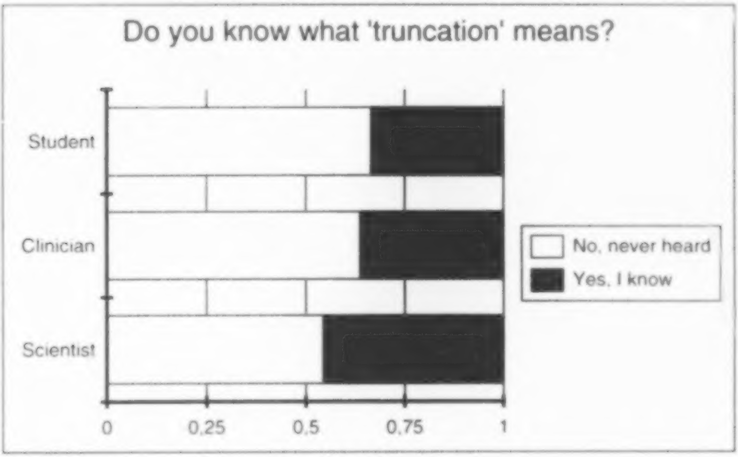

Figure 3:
Self-rating of end-users knowledge about truncation

The third aspect evaluated by the questionnaire regarded knowledge of MeSH-Thesaurus (MeSH = Medical Subject Headings) **(Figure 4)**. Less than one-third of the users (30%) said they knew the MeSH well. Almost half of the users (45%) had only some notion of it. Again, the highest degree of knowledge was found among the group of scientists. Interestingly, however, even among scientists more than every second said he/she did not know the MeSH well.

The major additional features of the fuzzy retrieval system take into account these methodical aspects by offering alternative ways to treat users input:

(I) Automatic word-stemming function instead of manual truncation.

(II) Possibility of free form natural language search query-input instead of Boolean search formulas.

(III) Implicit use of thesaurus and weighing information from free text and result ranking instead of nonranked Boolean result sets.

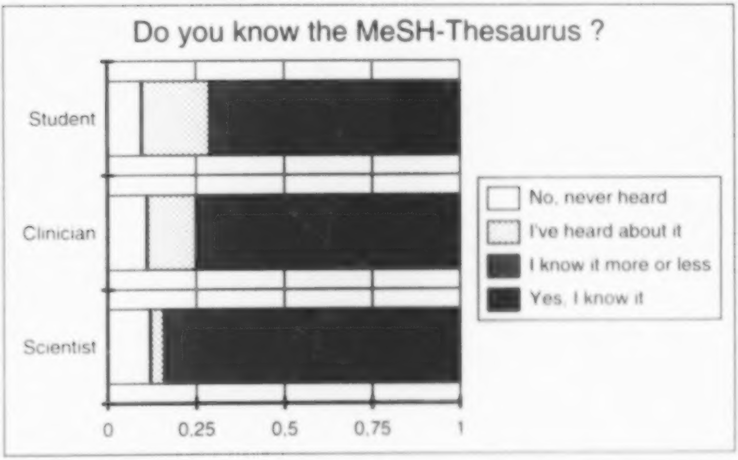

Figure 4:
End-users knowledge about the MeSH-Thesaurus (Medical Subject Headings of the National Library of Medicine's database MEDLINE)

Therefore we asked the users about some dimensions of perceived differences in "fuzzy" versus "Boolean" CD-ROM-retrieval, which they performed independently and without the assistance of professional searchers. Users were free in their choice of retrieval topics and usually chose questions out of their fields. Rather than taking external "golden standards" against which to compare the results, we always asked the users for a comparative statement.

Figure 5 shows the end-users subjective self-rating of the quantity and quality of the search result obtained by them with the fuzzy retrieval system as opposed to the traditional Boolean system. 8% of all users found less and/or worse references using the fuzzy system as opposed to the Boolean. In almost one third of all searches (30%) the results were comparable. In far more than half of the searches (60%), however, end-users felt they found more and/or more appropriate articles about the topic they were searching using the fuzzy system.

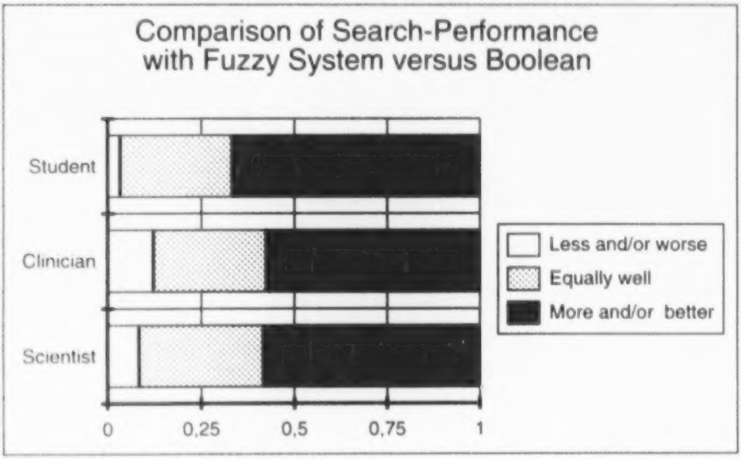

Figure 5:
Quality and quantity of the search result obtained with a fuzzy MEDLINE retrieval system as opposed to a Boolean system

Users were asked about the complete time it took to perform the search, select the relevant articles and print or save the articles **(Figure 6)**.

The entire time needed to perform a search and select the relevant article for output was judged faster with Knowledge Finder in 74% of all searches, equally fast in 20% and slower in 3%. Another 3% did not answer this question.

Apart from the above result and performance oriented questions we asked two questions about the interaction between the software, the user and the database.

The accessibility of contents of the data by the interface of the fuzzy system **(Figure 7)** was found optimal in 46% or at least logic in another 37%. Some 10% of the users felt the fuzzy system to be complex or confusing. Interestingly, the scientist and student group gave the highest rating to the fuzzy systems followed by the clinicians.

The overall ease of use rating for the fuzzy system is presented in **figure 8**. About 90% of the users said the system was comfortable and/or easy to use. Less than 10% found it difficult to use. There were no marked differences in the perceived ease of use by students, clinicians and scientists.

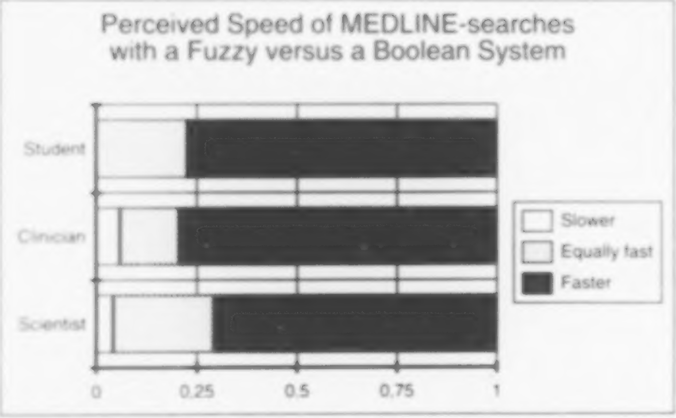

Figure 6:
Speed of performing a search (including selection of relevant documents) with a fuzzy MEDLINE retrieval system as opposed to a Boolean system

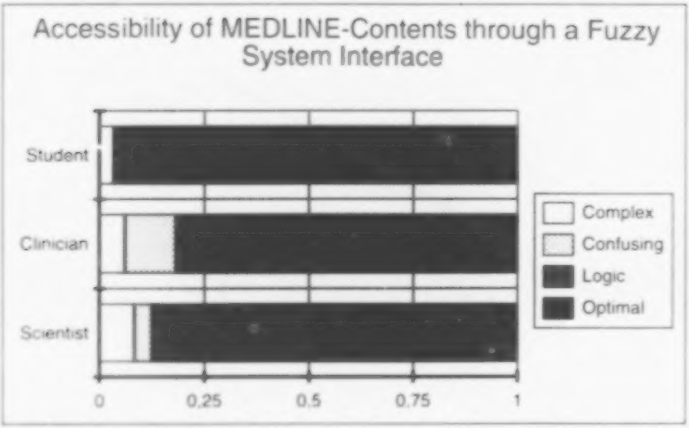

Figure 7:
Accessibility of the data of the fuzzy MEDLINE retrieval system using a graphical user interface with combined natural language and thesaurus/dictionary orientated search possibilities. Comparative end-users' self-rating with line- and commandoriented non-graphical Boolean system

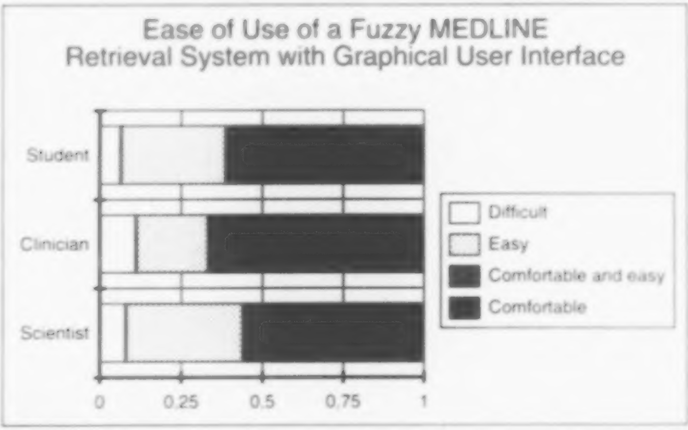

Figure 8:
End-user self-rating of ease-of-use of fuzzy MEDLINE retrieval system with graphical interface

As the above presented data suggested to us that different end-user groups may have different benefits from fuzzy retrieval we performed a regrouping of users to differentiate between novice users, average users and experienced end-users. Therefore, we added the points of experience of the users in 4 criteria (previous MEDLINE retrieval experience, experience with another retrieval system, knowledge of Boolean logic and truncation and the MeSH-Thesaurus knowledge). The maximum cumulative score was 10 points. The distribution of the population studied is shown in **figure 9**. We considered users with a low score of 1-4 points as novice users, users with 5 to 7 points as average users and users with 8 to 10 points as experienced.

Figure 10 shows the search-performance in dependence of end-user degree of experience. This figure presents the same data as figure 5 but in a different grouping. It shows that novice users have the largest benefit from the fuzzy system, but interestingly also more than half of the experienced end-users feel they perform better with the fuzzy system. Only about 15% of the experienced end-users felt they obtained a less favorable result.

A similar result is shown in **figure 11** (see also figure 8), which compares the rating of the ease of use for novice, average and experienced users.

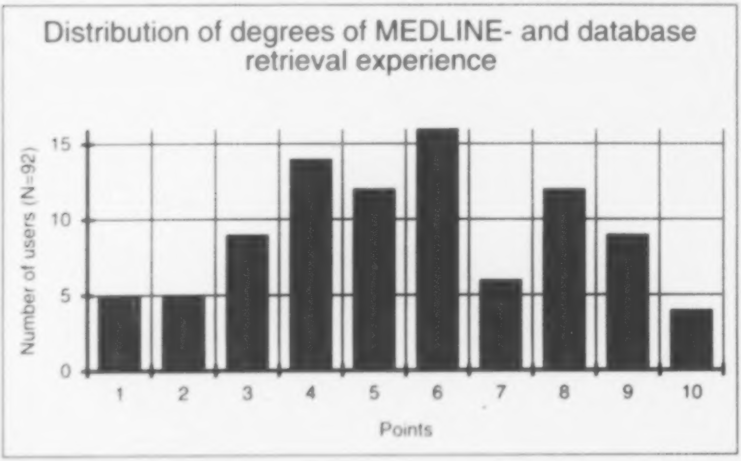

Figure 9:
Distribution of retrieval experience (composited from four qualities, see text) rated using a score with maximal 10 points

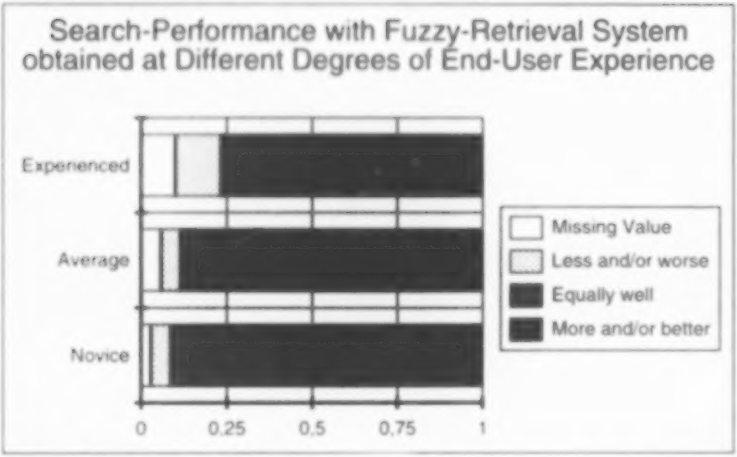

Figure 10

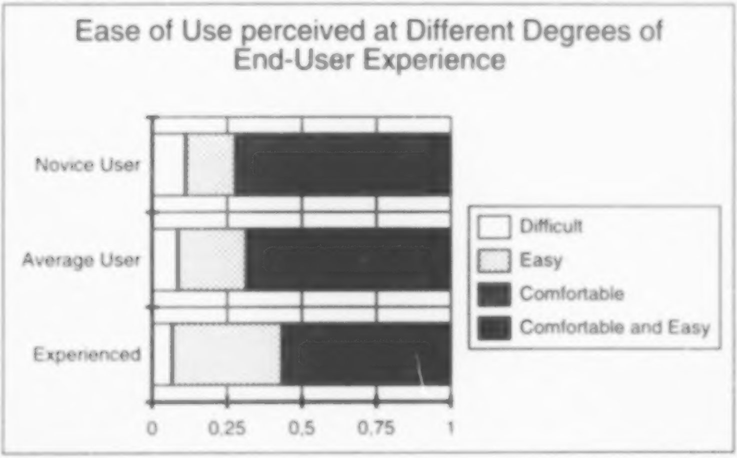

Figure 11

Discussion

In all three major isolatable dimensions of methodical retrieval knowledge we found that the three user groups, students, clinicians and scientists, reported, on average, increasing familiarity with the methods traditionally employed by Boolean systems.

We visualized in our figures that end-users are virtually creeping up a ladder of qualification step-by-step. Although we did not perform our study in a longitudinal design (looking at the same people overtime) but looking at different people at the same time, we feel that we can expect the average end-user today to develop over the years similar to the profiles we found as he she uses MEDLINE through his professional career.

Reading our data "from the other end", however, we have to presume that the average clinician or scientist even after some years of MEDLINE-experience and exposure to library training courses still is left with considerable methodical retrieval deficits in one or the other dimension. Long-term experience thus seems to have only limited influence on the improvement of end-users theoretical background.

One might ask, why do end-user not learn it?! Do they want to? Do they have enough time? Is there an interference of Boolean rules and thesauri with "fuzzy" medical reasoning?

We can't answer these questions today, but we suggest, that this status-quo is at least realized and taken into account for future research and decisions.

The time-saving effect of Fuzzy Logic that we observed also corresponds with the results of Dalrymple and Cox.[1] They measured the time for input of natural language queries and found it took on an average only a small fraction of time compared with the construction of a corresponding Boolean search statement (approx. five times faster, personal communication of author).

Our impression was, that the fuzzy system not only reduced the time to input a single query, it also cut the time to view the results by ranking, it facilitated the process of reformulating the query interactively and it seemed to reduce the overall number of necessary optimization steps needed to converge to a subjectively satisfactory result.

However, further investigation with statistical quantitative data on every search will be needed to get more precise answers to how and how much time is saved at what stages of the search. When we initially planned the study we expected (together with expert librarians and professional researchers consulted) that any benefits of the new fuzzy search technique would probably, if at all, be clearly limited to the group of inexperienced novice users with large methodical retrieval deficits.[4]

We were not sure whether the enhanced logic and software techniques would make any difference to the retrieval process and results for the average end-user or even the most-experienced ones; some of us even felt the "fuzziness" might deteriorate experts' retrieval result especially when they are used to "the complete control" which Boolean systems offer within their limits.

The empirical data suggests that experienced users feel almost the same considerable degree of improvement over the Boolean system as novice end-users do. They are much better than those of novices as for as recall and precision are concerned but apparently every group felt and reported substantial relative improvements at their level.

This indicates that today there may still be a large "sleeping" reserve potential of additional benefits. Doctors and librarians may not know about methods which will enable libraries to offer empowered services with advanced text retrieval technology available to their end-users.

Before concluding that measurable additional benefits from Fuzzy Logic to MEDLINE retrieval is not limited to novice end-users but extends through all groups of end-users including the most experienced, we have to bear in mind the limited control-mechanisms of our study design and the limited reliability of individual responses regarding subjective judgments about search result quality. Kaltenborns findings[4] that novice users are most uncritical and tend to overestimate their performance, whereas more experienced end-users are more likely to be overcritical however is in favor of the usefulness of your data.

Although it has been predicted theoretically and experimentally by information science for years, that Fuzzy Logic natural language text retrieval with relevance ranking should yield better overall results of database searches. We still have little knowledge today what this prediction means in practice, applied to the biomedical and health care field. A recent comparative work of Hersh and Hickam[5] suggests a considerable importance of different indexing and search techniques applied to MEDLINE data and for different degrees of user expertise.

In concordance with the study we performed, they summarized that natural language input and ranked retrieval output may provide better performance for physicians over traditional Boolean-style MEDLINE system.

The study by Dalrymple,[3] which also compared results quality for Boolean/thesaurus based versus fuzzy/natural language retrieval as judged by independent medical experts, who were not involved in searching, equally brought up results that were very similar to the data of subjective self-rating we obtained:

- In one out of three searches there were no noted differences in results quality;
- About 10% of searches gave results of inferior quality, but more than 50% of the questions yielded better answers with the new enhanced searching technique.

Our study has only been possible as a joint approach of the three major professional groups involved: Librarians, information professionals and health professionals. We hope that other groups of investigators increasingly work in this extremely fascinating and promising field. Our study indicates that today there might still be a large "sleeping" reserve potential of additional benefits that doctors and librarians know too little about and that may enable libraries to offer empowered services by making advanced text retrieval technology available to their end-users.

Possible reasons for search result improvements for experienced end-users through Fuzzy Logic range from inherent terminological, grammatical and semantic problems with the ambiguity and variability of natural language across obvious coding errors or inconsistent indexing to human forgetfulness and possibility to fail at extremely formalized and nontolerant operations and interactions with machines.

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Advances in OPACs in Europe : An Overview

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Abstract

Online Public Access Catalogues (OPACs) are challenging, since they are no longer just an electronic version of the 'library card catalogue' located in the library. Opening the library for external use allows for important resource sharing of library materials. Thus, this also creates increased demands on user friendliness and quality of the systems.

Maybe we have reached a convenient time for reconsidering what we in 1993 mean by the abbreviation 'OPAC'. In a recent article in PROGRAM* it is suggested that the abbreviation 'OPAC' in the future should stand for Open, Public, Accessible and Co-operative.

* Le Loarer, Pierre. OPAC: opaque or Open, Public, Accessible and Co-operative? Some developments in natural language processing.In: PROGRAM, 27 (3) pp. 251-268, 1993.

Publications of Essen University Library, Vol 17, pp 237-252, 1994

The demand for being Open and Public means that today's OPACs should serve as the library's show-case to the users locally and remotely and display documents, services and information resources available in the library or elsewhere. OPACs should allow for online access to document ordering and delivery. Library resources should be open accessible for libraries and individuals via public and academic networks, nationally and internationally.

Looking at the OPAC module available in the major European library systems, work still has to be done in order to live up to the suggested new definition of 'OPAC'.

The paper will discuss some 3rd generation OPAC development areas, such as:

- **Network access**
- **Document types and services included**
- **Document ordering and delivery**
- **User interface**
- **Retrieval models**
- **Communication language**
- **Record enhancements.**

1. Introduction

My first Essen Symposium was back in 1985 and the theme was "The future of Online Catalogues". In 1985 the number of integrated library systems in Europe were some 250 and only 12 suppliers of larger library systems had each installed more than 5 systems.[1] The suppliers were IBM, McDonnell Douglas, ALS, Geac, BLCMP, etc. Today, it is assumed that more than 50 suppliers of larger integrated library systems are operating at the European market.[2]

When I was preparing my paper for this symposium, I considered the philosophical question, to what extend, we in 1993 have reached what we in 1985 called the "Future"?

The OPAC module in the way it appears today, as a special module designed - not for the library staff - but for the library user, was in the mid 1980s in most systems only in the very first stages.

The proceedings of the Essen Symposium in 1985 reflected well the problems and possibilities concerning 'The future of online catalogues'. A main concern was identification of workable techniques for conversion of the paper based catalogues and solving of the problems implied, such as preventing duplicate records by merging of files. We learned that the retrieval methods of the future were called 'navigating' and were introduced to the brand new software TINLIB. Mr Schoots from Rotterdam public libraries convinced almost everybody that the ALS 'Browser' with scrolling windows and touch screen represented the future.

In the light of the 1985 state, I am convinced that we so far have reached 'the future'. The records are now in machine readable form for use in OPACs and the today's retrieval software will allow for some kind of browsing - at least in the indexes of the inverted files. Scrolling windows in 'pop-up' or 'pull down' variations are common features in OPACs.

Maybe we have reached a convenient time for reconsidering what we in 1993 mean by the abbreviation 'OPAC'. In a recent article of the journal PROGRAM it is suggested that the abbreviation 'OPAC' in the future should stand for Open, Public, Accessible and Co-operative.[3]

Looking, however, at the OPAC module available in the major European library systems, work still has to be done in order to live up to the suggested new definition of 'OPAC'. This year, I have been involved as a subcontractor in an EC project initiated by the European Commission DGXIII/E/3 on preparing a 'European Directory and Evaluative Guide of European Library Systems', where a team of 4 consultants has reviewed some 35 of the larger systems in Europe.[4] The suppliers have been visited and descriptions of functionalities were worked out in co-operation with the suppliers. On the basis of the information collected, its obvious that many systems belong to the 2nd generation group based on out-of-date, proprietary technology. This observation is supported by Richard Heseltine, former marketing director of CLSI in papers published in 1993.[5]

In particular, many of the old mainframe based systems will not be able to implement a client/server system architecture. Further, the OPAC interfaces and retrieval software lack any sophistication. Through research and experimental works, we have a fairly good knowledge about user's information seeking behaviour and problems related to formulation of queries and successful conduction of a search. Many user studies using transaction log analysis, observation and 'think-aloud' techniques for data collection, prove the difficulties; thus these are not taken into account in the design of OPACs.

1.1 Directions of Developments in European OPACs

In this paper, the different directions of OPAC development will be discussed in brief. **Figure 1** shows a picture of various directions in which developments of European OPACs are currently taking place - all stages of each direction are already existing - not in one single product, since the priorities differ from country to country and also for types of libraries. The enhancements included in figure 1. can all be implemented in 3rd generation OPACs. Figure 1 does not cover other supplementary functions, which might be needed for a scholar's intelligent information workstation.

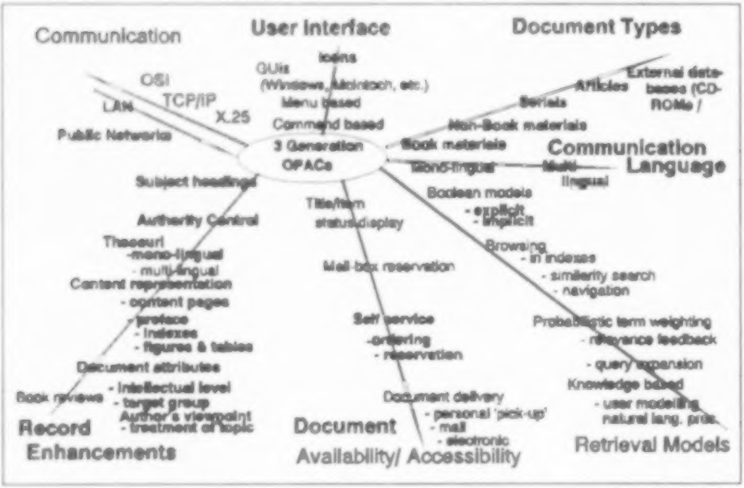

Figure 1: Directions of Development in European OPACs

2. The OPAC User Interface

The OPAC interface can be viewed from different angles. An important issue are the physical interface components **(Figure 2)**: the dialogue form, by which the user has to communicate with the system; the technical environment, namely the hardware platform and the peripheral units and finally the communication tools for data input/output.

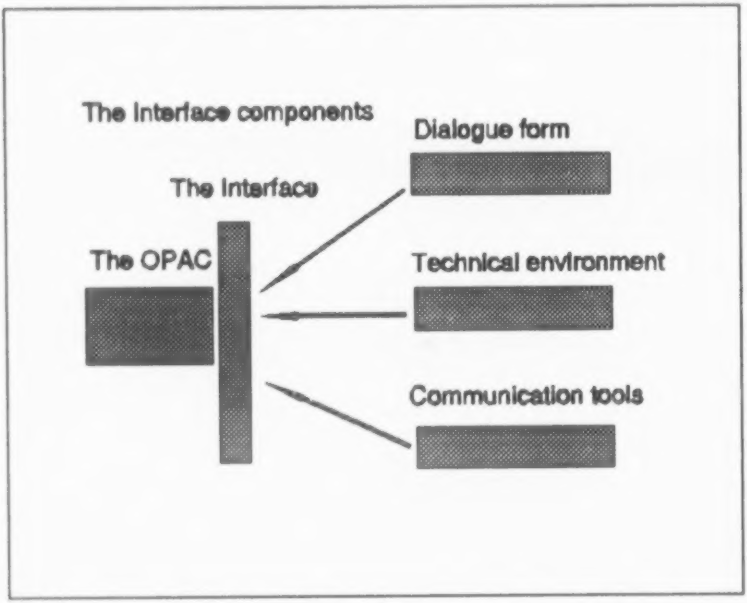

Figure 2: The OPAC Interface Components

2.1 Dialogue Form

The OPAC dialogue forms are either based on a command language or are menu based. Input of the search arguments is carried out in one or more special designed 'input screen(s)' (fill-in-forms).

Depending on the communication tools available, a 'pick- and point' technique might be used (to transfer search terms from an index displayed in a window to search screen by clicking a mouse/roller ball).

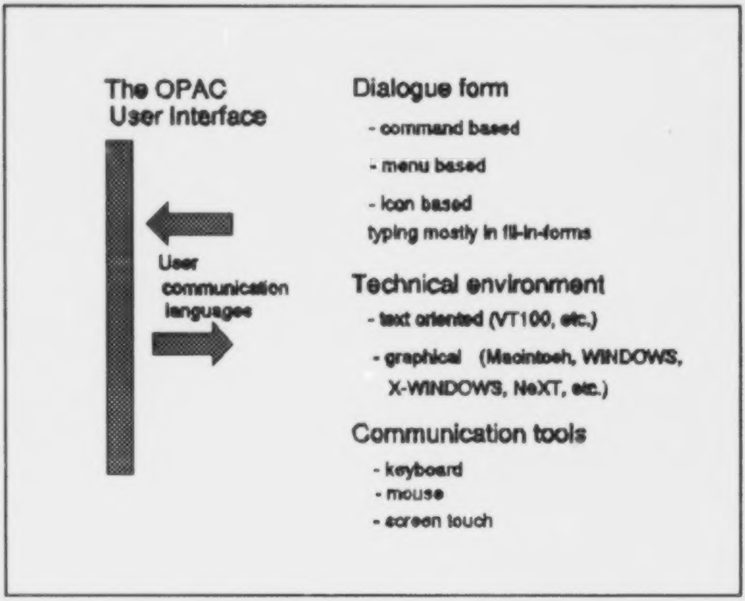

Figure 3: The Physical Interface Components

In Scandinavia, not least in Denmark the Common Command Language (CCL) according to the ISO-standard is almost a prerequisite for selling a system - probably because the systems specifications (including the OPAC retrieval) have been defined by librarians, who are familiar with CCL from searching external bibliographic databases, such as the Danish national bibliography and the union catalogues of books. This has resulted in quite advanced retrieval facilities in the OPACs, such as phrase searching, range searching, zoom (search set analysis), Boolean AND/OR/NOT, truncation (left/right), etc. In many libraries the end-users will have to use this communication mode.

Some systems developed for MacIntosh or Windows use icons as an input option. Icons either substitute the main menu screen or are used as entry to subject retrieval (presenting a screen of icons as the main menu for subject search). In the United States this approach has recently been implemented in, ie, the CARL's 'Kids Catalogue'. In Denmark the supplier DANTEK has developed an icon-based interface for public and school libraries (product DANKATALOG) for the Danish and German market (running under WINDOWS or X-Windows).

Among the icon-based systems one system, namely the Danish developed Book House, is in particular interesting, not only due to its interface, but in particular due to its underlying data structure. The system works on the basis of records, which have been enhanced with additional, alternative descriptions of the documents (in this case fiction). The books are described in a multidimensional classification scheme, where the main facets are author's intention; frame/setting of the subject matter; subject matter and accessibility. I do mention this, because the indexing principles developed for the Book House system in 1993 will be adapted by the Danish Library Centre for children's materials, and include indexing of non-fiction materials.[6, 7] This example is interesting because it proves that real retrieval improvements require more work than just a few coloured icons on the surface of the system.

2.2 The Technical Environment

Most of the current OPACs are running in a traditional text-oriented environment using dedicated VT100 terminals or PCs with terminal emulation software.

OPACs designed for real GUI environments under UNIX, using ie Motif or NEXT-STEP and implemented in a client/server systems architecture, are only recently developed in Europe. DYNIX's Marquis is the only system with all models fully developed for WINDOWS. Marquis is in Europe implemented in a few sites in Germany. On the French and UK market, for instance, the so called Go-PAC of the MARCo system from Data Trek is now available under WINDOWS.[8]

2.3 The Communication Tools

For the data input keyboards are still the far most used communication tools. Systems, such as TINLIB, the new Adlib from Databasix in the Netherlands and Geac have installations in Greece, with implementation of full Greek characters for OPACs retrieval. An interesting development on the extended character set will appear in the new OPAC of the British Library at St Pancras (data server running the WINDOWS version of the BRS text retrieval software), where over 800 different characters can be searched, including Greek, Cyrillic and Hebrew. To do this the system will display simulated keyboards on the terminal screen and the 'keys' will be pressed using either touch screen or a mouse.”

Touch screens have been out of the OPAC market for a period, but now seem to have a comeback with, ie, CLSI's new touch screen. One of the Danish systems, SUPERMAX from DDE is now available under WINDOWS in a prototype version, developed by a customer using MicroTouch in a touch screen design for the OPAC.

3. Retrieval Models

The retrieval software in most OPACs still puts a lot of the efforts on the user. Even if we know that more than 10% of 'no-hits' occurs from simple spelling mistakes. Automatic spelling corrections, stemming and cross-referencing or facilities such as phonetic search are not yet standard in the retrieval software.

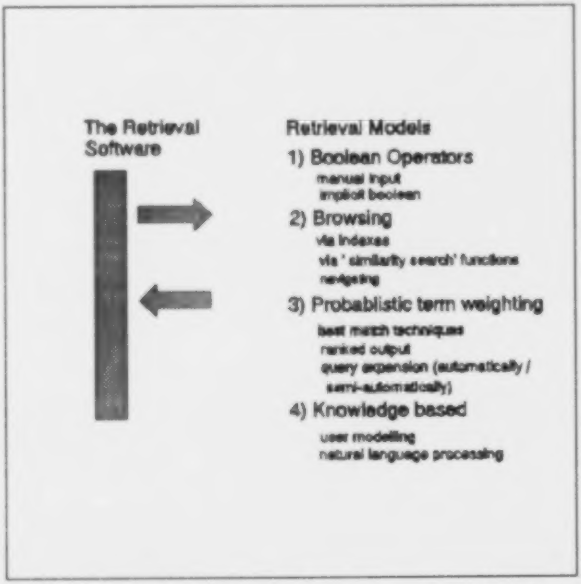

Figure 4: Different Models for Information Retrieval

Retrieval models for existing OPACs can be divided into different categories, representing various approaches to information retrieval **(Figure 4)**. The models can be implemented in the "old fashioned" OPAC interfaces as well as in the GUI environments.

3.1 Boolean Operators

The Boolean retrieval model is based on exact match and treats automatically all search terms equally (weight and value). Simple Boolean retrieval is carried out either by using a command language or by searching via a menu driven interface.

Query modification in OPACs is often carried out stepwise either by limiting or expanding the search by parameter at the time. The difficult retrieval task (expanding limiting a search) is lacking sufficient help and support in existing software (for checking this hypotheses, query expansion advices when the user gets '0-hits' can be tried out OPACs where the retrieval software is based on exact match).

3.2 Browsing

Browsing as retrieval technique has during several years been recognized as an information retrieval approach, which for the user seems suitable for conducting an 'evolving search'. Marcia Bates[10] calls the browsing technique, which starts with just one feature of a broader topic, or just one relevant reference and moves through a variety of sources for 'Berry picking'.

Browsing via indexes is standard in most retrieval software and swift transfer of search terms from indexes to search templates will be expected in most OPACs. In contrary, browsing implemented as 'similarity search' is more complicated, unless for options for searching 'similar books' are implemented as a simple hidden function retrieving 'books of the same author, books with same classification code or subject heading (seen ie in DYNIX systems). The LIBERTAS system from SLS has implemented the similarity search facility using some of the features developed in the experimental system OKAPI (mentioned below).

One hinder for a good browsing tool is that even if many suppliers do support construction of online search thesauri (or some kind of representation of semantic networks), which could be consulted in the browsing session, the construction of thesauri requires costly human resources. Therefore those tools are not implemented in many European OPACs (not even monolingual thesauri). Exceptions are countries with centrally developed tools for controlled vocabularies (ie Germany).

The browse and navigate model has been used in the design of the TINLIB system produced by IME. Through hypertext like links any part of a bibliographic record can be selected to retrieve other document sets.[11]

3.3 Probabilistic Term Weighting

In contrary to the Boolean model, the probabilistic model allows for discrimination between retrieved items. Hancock-Beaulieau[12] explains the advantages this way: "The probabilistic model on the other hand, by weighting query terms and statistically comparing them with each record in the database, can estimate the likelihood that a record is relevant to the query and rank the output according to the degree of match".

The British Library Research and Development Department has for almost 10 years supported research projects in this area, primarily projects taking place at City University in London developing the experimental system OKAPI.

"OKAPI is a 'best match' fully operational experimental system developed at City University in London. It uses inverse frequency weighting to allocate weights to query terms, ie common terms are assigned lower weight than rarer terms, on the assumption that the latter are better discriminators of relevance. Output of records are ranked.[13] Two current projects are concerned with thesaural navigation and the use of a GUI to allow the user to participate in term selection for query expansion. The system is being developed in a distributed environment on a SUN machine with X windows" [using Motif].

Among the operational systems, ie ORACLE's Library system in the UK is now testing the viability of this model.

3.4 Knowledge Based Retrieval

In IR research several efforts have been made on implementing different user models into prototype systems by trying to categorize the users into different categories, such as 'naive, intermediaries or experts'. In OPAC design this approach would be difficult due to the fact that the user community is too diffuse and tasks and knowledge (domain/system) varies too much to create a simple model for a library user. A more pragmatic approach could be to implement a more 'mechanical' user identification facility when starting a search by keying in borrower number or similar. The system should then be able to identify whether the user was a first years student, a post graduate researcher of a staff and remember when last visit to the OPAC has taken place. By this kind of identification, different levels of help and search assistance could be activated.

4. The OPAC - from the User's Perspective

Figure 5 illustrates in brief the library OPAC and its problems, seen from the users point of view. User studies carried out in the last decade, in particular in UK and America document that the users have difficulties with the retrieval interface.

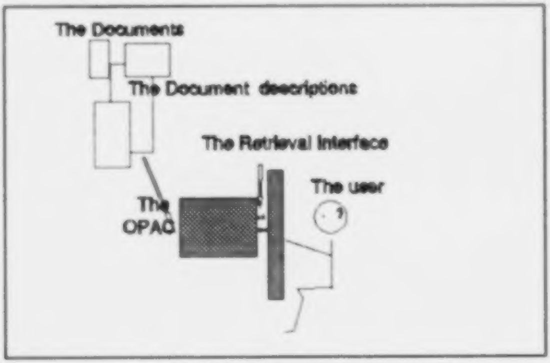

Figure 5: The OPAC - from the User's Perspective

The difficulties include areas, such as how:

- to conduct a search successfully (semantic and conceptual problems)
- to understand Boolean logic
- to understand help messages
- to understand document descriptions
- to understand what kind of documents can be found in the OPAC.

Beth Sandore's paper presented at this symposium is just one example of a user study showing that 61% of the searches result in '0-hit' and 80% of the users retrieve nothing more than 3 times during a search session. Unfortunately, Sandore's figures are not exceptional, but similar to figures gained in other user studies.

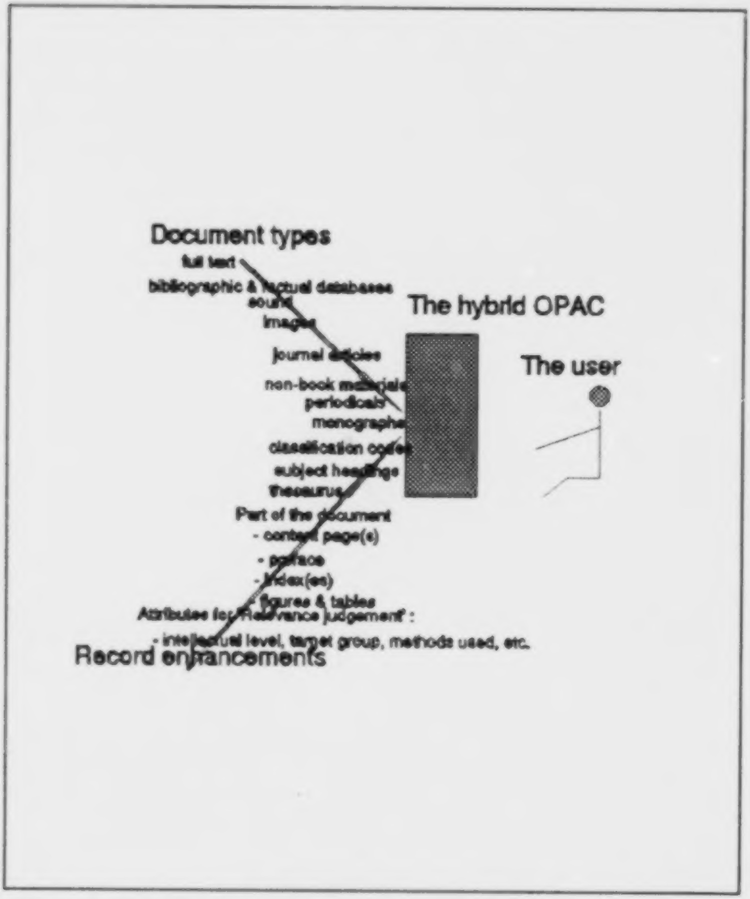

Figure 6: OPAC Enhancements: Document Types / Document Description

5. Record Enhancements

The classical subject description in the bibliographic records are classification codes, subject headings, keywords or eventually a thesaurus feature linked to the file of records **(Figure 6)**. On experimental basis additional parts of documents are added to the records. Record suppliers, such as OCLC have experimented with different types of record enhancements and some 20 different enhancement methods and options were published in 1990.[14] This includes:

- content page(s)
- preface
- index(es)
- figures and tables.

The American project MERCURY at the Carnegie Mellon University in Pittsburgh is currently developing a retrieval facility, which can separate figures, tables, images, etc so it will be possible to give a command like: "take me to the next figure".

Thus, even if the different record enhancements should be seriously considered, European libraries (particularly outside the UK), will still have an important multilingual problem to deal with. Content pages, prefaces etc. scanned into databases will be in several different languages, and will not necessarily improve the precision rate of a search. Real tools for multilingual access to the documents (except from traditional multilingual thesauri, when available) have not been developed for the library systems.

5.1 Attributes for 'Relevance Judgement'

A number of attributes linked to the individual bibliographic item are not expressed in detail in most subject classification systems used in Europe, such as 'the intellectual level', 'target groups', 'authors intention', 'methodologies used'. Schemes, such as UDC allows for expressing these aspects, but in practice the options are not used very often - and would not be a friendly help for the user anyway, since they are not keen of using classification code for subject retrieval.

Exceptions are those libraries, who use facetted indexing, ie PRECIS. The need for description of intellectual level and the function of a work was recognized already back in the 1970s, where LIBER did foresee that the existing machine readable cataloguing formats were not adequate for future retrieval requirements. In order to look at this problem IFLA published in 1977 a report entitled: International Target Group Audience Code (ITAC) taking into account existing codes of this kind. Record enhancement is an important issue - not least when the use of OPACs is not longer necessarily taking place in the library, but remotely via campus networks or via, ie, Gopher services on Internet.

OPACs are challenging, since they are no longer just an electronic version of the 'library card catalogue' located in the library. Opening the library for external use allows for important resource sharing of library materials. This, however, creates increased demands on user friendliness and quality of the systems and the data representation, which I have discussed in this presentation.

6. Conclusion

I might leave you with the impression the title of my paper should have been 'The lack of advances in European OPACs'. Thus, the intention of this paper was not to be negative - if we go back to **figure 1**, a lot of developments on the 3rd generation OPAC are actually taking place. Further, the last five years have changed the automation situation in European libraries dramatically - not least in Southern Europe. The automation level and experience gained should leave us with optimism. Thus, I recommend that we change the focus of the library automation issues from the library's internal functions to the user's need for electronic services. Therefore I suggest that the theme for one of the forthcoming Essen symposia should be: 'The electronic library - seen from the user's point of view'.

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Improving Data Quality in an OPAC from the '70s

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Abstract

The bibliographical database of the Swedish national network LIBRIS was designed in the beginning of the 1970s with a very broad scope but implemented mainly as a union catalogue for interlibrary loans and for production of catalogue cards. Since 1987, when Swedish research libraries started installing their own local systems, the role of LIBRIS has changed: While retaining its importance in ILL, it is now a clearing-house for the exchange of catalogue records between the local systems, also supplying foreign MARC records.

Changes of cataloguing rules and local traditions have brought about that the file does not meet any requirements in the consistency in design of headings, and the apparatus of references between variants is insufficient. Thus, the modern local systems

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with authority control (with USMARC formats) for authors, titles and subjects meet with maintenance problems when receiving downloaded records.

The three biggest Swedish university libraries, all using VTLS software, have undertaken to help to do away with this difficulty, firstly by uploading authority records into LIBRIS where they act as advice to searchers and cataloguers. Methods and advantages respectively difficulties of this exercise are described, as is the theoretical background of making a wider use of this information.

Artifacts are subject to ageing, and the rate of ageing differs between the different kinds of artifacts. Given proper maintenance, you are quite comfortable in a house from the 1910s, much more so than you would be in driving a car from the same period, and drastic changes in hardware make a tape recorder or a record player from the 1960s feel more antique than a car from the 1930s. It would also be more difficult to maintain, with lack of spare equipments.

The rate of ageing is a psychological effect, a result of several component parts, and the artifact is in itself a reflection of its origin, the climate and the state in which it was originally conceived. In eminent degree, this is the case in old databanks, and in view of the investment made, their preservation and maintenance are of priority interest to everybody.

The database that is the bibliographical facility in the Swedish national network LIBRIS is an evident example of this. LIBRIS was first designed in 1972, to allow something similar to a distributed input into a union catalogue for Swedish research libraries. The first real product that appeared was a union accession list for foreign monographs, and the basic data was collected from catalogue cards sent to a central agency for input.

Already from the beginning, the scope of the system was, however, set at becoming the Swedish library network, helping all libraries with everything from serials control and local loans to qualified information retrieval. The first outlines are - today - somewhat ridiculous, although they were very advanced for their time.

From 1974 to 1979, LIBRIS was consolidated for the big research libraries. Although just few libraries could participate actively, you had your decentralized input, you used records input by other libraries or you edited BNB

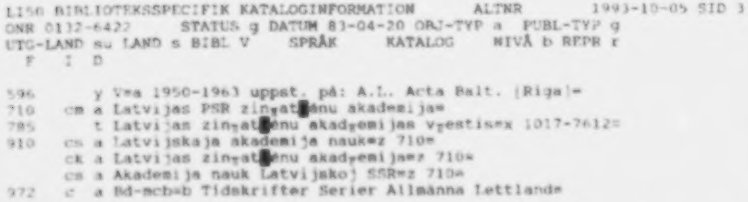
MARC records, and all this made that you had to do away with much of your local varieties in cataloguing. All libraries using LIBRIS had to have the same main entry and the same form of the main entry heading for any publication that was owned by more than one library, and that was the case in more than half of the records for foreign material and for all Swedish ones. New cataloguing rules were prepared, modelled on AACR but with respect to the emerging ISBDs.

But the main product was the catalogue card, to be filed into a card catalogue, although lists such as the Swedish national bibliography and the union accession lists were taken through LIBRIS. Special protection was introduced for data quality in national bibliography records, which were, like the rest, used for production of catalogue cards.

The card catalogue is fairly easy to keep user-friendly, if you do it locally, but it is more cumbersome to make it hospitable to cards produced centrally. In catalogue technique, the choice of the main entry became less important, as many Swedish libraries with closed stacks abandoned alphabetical shelf order and began to give each volume a unique number. The problem of the form of the heading prevailed. Reference cards were of course the remedy for that.

Thus, and also to ensure that each list product was produced with all the references caused by the actual subset of records, the format contained a 9xx region for references, which had to be input into every record where the corresponding, approved form was to be input in a 1xx/7xx field. Then, in ordering a set of cards, you could order the set with or without the "See"/"See also" cards, depending on the status of your own card catalogue.

Thus, a record could look like the one in **figure 1**, where the authorized form in field 710 has its three accompanying variant forms in the 910 tags.



```
DET FINNS 1 SID


LI50 BIBLIOTEKSSPECIFIK KATALOGINFORMATION      ALTNR        1993-10-05 SID 3
ONR 0132-6422      STATUS g DATUM 83-04-20 OBJ-TYP a  PUBL-TYP g
UTG-LAND su LAND s BIBL V    SPRÅK      KATALOG     NIVÅ b REPR r
  F   I   D

596        y V=a 1950-1963 uppst. på: A.L. Acta Balt. (Riga)=
710    cm a Latvijas PSR zin,at█nu akademija=
785        t Latvijas zin,at█nu akad,emijas v,estis=x 1017-7612=
910    cs a Latvijskaja akademija nauk=z 710=
       ck a Latvijas zin,at█nu akad,emija=z 710=
       cs a Akademija nauk Latvijskoj SSR=z 710=
972    c  a Bd-mcb=b Tidskrifter Serier Allmänna Lettland=
```

Figure 1: The latter part of a LIBRIS record with the reference block in tag 910

Of course, this did not work in a cooperative environment. So, for example, the Estonian and the Russian form of the name of the Estonian Academy of Sciences were both authorized, as coexistant, with a certain amount of references made between them.

After some years, the use of the database itself for searches increased, and it became necessary to learn to use this information in online searching. People did not understand the difference between authorized forms and others, and we also did have the information in each record. We decided to equalize the 9xx area with the 1xx/7xx area for searching purposes, with just a small technical code in the lists of alternatives. Then, the online user could find what he/she was after and need not bother about different forms. Well, as in many of those things, it was better to do something than to do nothing, and for the time - that was about 1978 - it was maybe the best.

For quality of data, or of the new data, the result was not far from a disaster. The direct effect was that libraries preferring the quick-and-dirty way ceased to search for the authorized form with its variants, forming a 1xx/7xx + 9xx block, and began to input just the form in the item being catalogued. For those searching for a known item, it may not be of great importance, but if you want to give an overview of works emanating from a certain author, it is very cumbersome, almost unethical, to put at disposal a catalogue that uses parallel variant forms. Chronological sequels of variants must be joined by references, but parallel variants must be banned.

As long as card production was predominant, libraries had certain exercise at changing each other's entry headings to become more consistent, and the former agency for production of the union accession list had to weed in this jungle of variants for their own needs, so efforts were being made.

In 1983, LIBRIS was still mainly a card printer, but the aspiration of becoming a maid-for-all-duties was gone. Only catalogue support for copy cataloguing, interlibrary loans and union catalogue function were really up and thriving, but the system had moved in 1979/80 into a new computer environment with a large IBM mainframe and a network able to manage several hundred terminals, more libraries participated more actively, and the local systems were coming.

In 1983, in fact, it was solemnly declared that LIBRIS would have just the three scopes mentioned above and that all local management would be handled over to local library system softwares acting in each library. On the other hand, it was important to keep the contact with LIBRIS in order to contribute to that database for these purposes and to get catalogue support from the records already available in the file. Mostly, that was accomplished by cataloguing in the LIBRIS environment, just as before, copying new and changed records, and transferring them in batch to the local system **(Figure 2).** It can be added that most local system software showed up having this technique as their first option, as they were developed in US environments with access and obligations to OCLC.

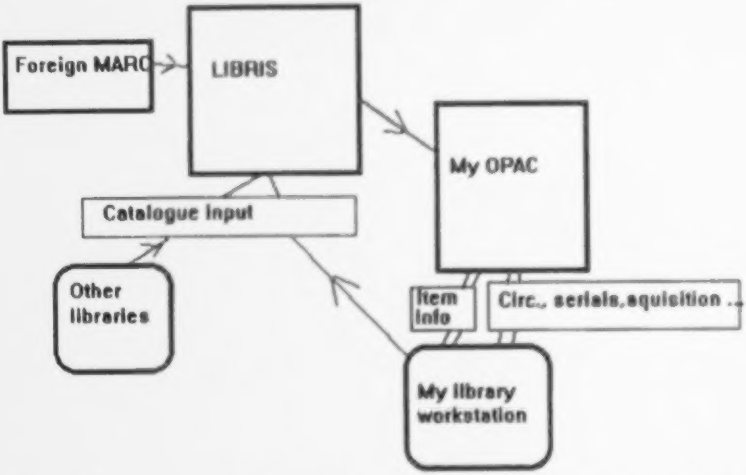


Figure 2: Outline of the workflow in a library using LIBRIS and a local system

During the rest of the 1980s, Swedish research libraries computerized themselves, installing local systems of different brands and philosophies, but strangely enough, LIBRIS is still showing increase in use and database size. Partly, that is due to the searches made to make sure if there is a record for a new item to be catalogued, but also patrons search. As a source for bibliographic information, the system supplies records from Great Britain, US, Germany and the ISDS system, in addition to the Swedish imprint.

In 1988 and 1989, the three biggest Swedish research libraries bought the same software for their local systems, VTLS. This software contained full-grown authority systems for authors and subjects, afterwards complemented by one for titles. When these libraries copied and loaded their 600,000 + records each from the LIBRIS database into their own machines, the full width of the confusion in LIBRIS became evident. Authors got three - or more - authority records even closely to one another, due to insignificant variations in input practice. The cases, where a see reference in one record met an authorized form in another, were flagged and reported. Much work was done locally on merging authority records, changing priorities between authorized forms and references.

However, these efforts were counter-acted by the fact that the LIBRIS system was not involved. The next time a record was downloaded with a non-authorized heading, the process had to be iterated, and so it went on. It became a Sisyphus work. It might even be that the same record came along on several times, due to some updating, and then the local authority system had to be corrected after each downloading.

More in the dark, something had been done for LIBRIS in this context, however. The national bibliography activity had become part of the cooperative LIBRIS input, as the libraries did not wait for the central input. The central agency at the Royal Library just had to check and correct, especially in the names of corporate bodies and government agencies, and that work revealed that an authority file was desperately needed. In a makeshift process, bogus catalogue records were set up that you could find in a prescribed way, and containing the authorized form and a number of references.

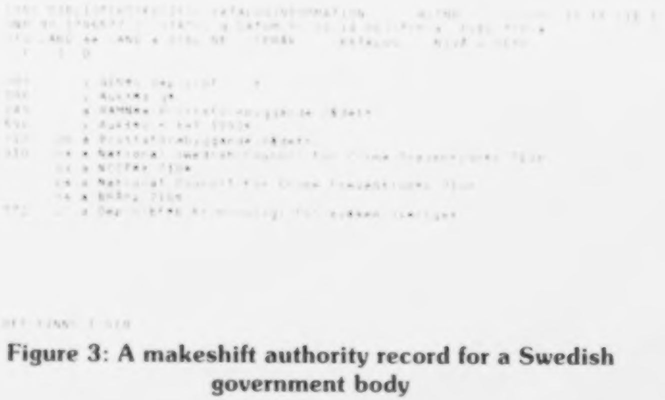
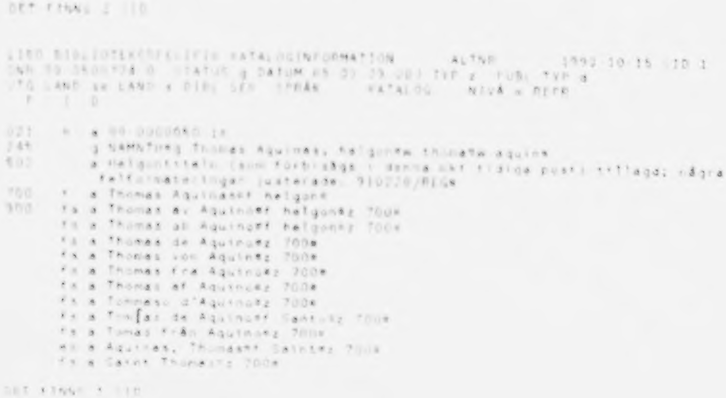


Figure 3: A makeshift authority record for a Swedish government body

Figure 3 gives you an example: In a title field 245, a uniformed bogus title is input with technical coding, and then we have the usual block of 71x for authorized form, 91x for variants. For monitoring, these records are formatted as records for parts of multi-volume publications, each initial letter of the alphabet forming one set.

Little by little, the same technique was expanded into names of persons as well, beginning by names of classical authors from ancient and/or medieval eras and by names of persons in difficult languages such as Arabic. In **Figure 4**, an example is given for one of the more voluminous medieval authors.

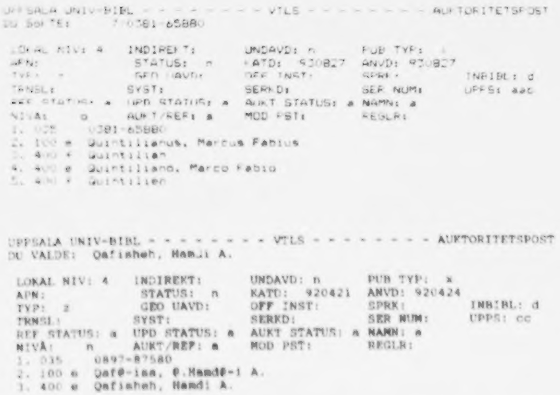


```
DET FINNS 2 [illegible]

LIBRIS BIBLIOTEKSSPECIFIK KATALOGINFORMATION      ALTNR      1992-10-15 ID 1
[illegible]

021    k  a [illegible]
245       g NAMNform Thomas Aquinas, helgon#w thomas#w aquinas
500       a Helgontitel (som förbisågs i denna akt tidigare post) tillagd; några
           felformateringar justerade. 910220/REG*
700    *  a Thomas Aquinas## helgon#
900   fs  a Thomas av Aquino## helgon#z 700*
      fs  a Thomas ab Aquino## helgon#z 700*
      fs  a Thomas de Aquino#z 700*
      fs  a Thomas von Aquin#z 700*
      fs  a Thomas fra Aquino#z 700*
      fs  a Thomas af Aquino#z 700*
      fs  a Tommaso d'Aquino#z 700*
      fs  a Tomás de Aquino## Santo#z 700*
      fs  a Tomas från Aquino#z 700*
      fs  a Aquinas, Thomas## Saint#z 700*
      fs  a Saint Thomas#z 700*

DET FINNS 3 [illegible]
```

Figure 4: A makeshift authority record for a personal author

The major effort that everybody waited for was initiated as an enhancement project and funded by special money. Its method was that the three VTLS libraries were to establish authority names for "difficult" persons and sell them to LIBRIS. The funds available were sufficient for about 35,000 authority records, and the libraries undertook parts of it by a simple alphabetical and linguistical distribution. They worked from their own authority files, and in very many instances, an Internet connection to the LC files proved a very valuable support.

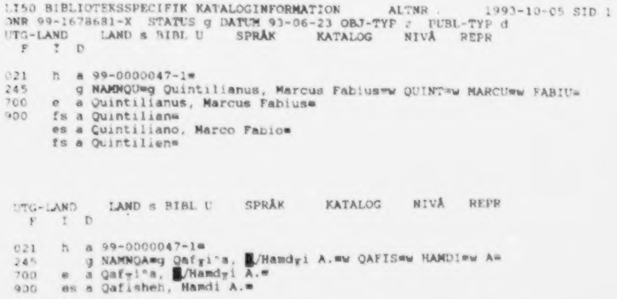
BEST COPY AVAILABLE



```
UPPSALA UNIV-BIBL - - - - - - - - - VTLS - - - - - - - - - AUKTORITETSPOST
DU SÖKTE:      7-0381-65880

 LOKAL NIV: 4   INDIREKT:       UNDAVD: n      PUB TYP:
 APN:            STATUS:  n     KATD:  930827  ANVD: 930827
 TYP:  -         GEO UAVD:      OFF INST:      SPRK:          INBIBL: d
 TRNSL:         SYST:           SERKD:         SER NUM:       UPPS: aac
 REF STATUS: a  UPD STATUS: a   AUKT STATUS: a NAMN: a
 NIVÅ:    o     AUKT/REF: a     MOD PST:       REGLR:
 1. 035     0381-65880
 2. 100 e  Quintilianus, Marcus Fabius
 3. 400 f  Quintilian
 4. 400 e  Quintiliano, Marco Fabio
 5. 400 f  Quintilien


UPPSALA UNIV-BIBL - - - - - - - - - VTLS - - - - - - - - - AUKTORITETSPOST
DU VALDE:  Qafisheh, Hamdi A.

 LOKAL NIV: 4   INDIREKT:       UNDAVD: n      PUB TYP:  x
 APN:            STATUS:  n     KATD:  920421  ANVD: 920424
 TYP:  z         GEO UAVD:      OFF INST:      SPRK:          INBIBL: d
 TRNSL:         SYST:           SERKD:         SER NUM:       UPPS: cc
 REF STATUS: a  UPD STATUS: a   AUKT STATUS: a NAMN: a
 NIVÅ:    n     AUKT/REF: a     MOD PST:       REGLR:
 1. 035     0897-87580
 2. 100 e  Qaf@-isa, @.Hamd@-i A.
 3. 400 e  Qafisheh, Hamdi A.
```

Figure 5 A-B: Two authority records as extracted from the VTLS system

The records are extracted in the common LC MARC for authorities format, shown in **figure 5 A-B**, and converted into LIBRIS to coincide with the makeshift record structure **figure 6 A-B**. As before, they are found in the general LIBRIS database, searchable by the uniform title and on any of the names, but in addition, they are also in a S&R copy of the database established under the software STAIRS. The records are displayed somewhat differently from these files, but still, you get all that is needed:



```
LI50 BIBLIOTEKSSPECIFIK KATALOGINFORMATION      ALTNR .      1993-10-05 SID 1
DNR 99-1678681-X  STATUS g DATUM 93-06-23 OBJ-TYP z  PUBL-TYP d
UTG-LAND     LAND s BIBL U     SPRÅK       KATALOG     NIVÅ    REPR
  F    I  D

021    h  a 99-0000047-1=
245       g NAMNQU=g Quintilianus, Marcus Fabius=w QUINT=w MARCU=w FABIU=
700    e  a Quintilianus, Marcus Fabius=
900    fs a Quintilian=
       es a Quintiliano, Marco Fabio=
       fs a Quintilien=


UTG-LAND     LAND s BIBL U     SPRÅK       KATALOG     NIVÅ    REPR
  F    I  D

021    h  a 99-0000047-1=
245       g NAMNQA=g Qafɣi°a, █/Hamdɣi A.=w QAFIS=w HAMDI=w A=
700    e  a Qafɣi°a, █/Hamdɣi A.=
900    es a Qafisheh, Hamdi A.=
```

Figure 6 A-B: The same records as in figure 5 A-B, after loading into LIBRIS

What has this meant to LIBRIS?

Since a cataloguer, at his PC workstation, can have sessions up both in LIBRIS and in STAIRS at the same time, and in LIBRIS even two of them, one for search and another for input, he can find good support in any name problem he may meet in his work without really interrupting his online input. He just shifts out into another session, and he can even copy fields between sessions. Also, he is helped so many times that he finds it worth-while to, and learns to, look for support and not just be content with the form in the item at hand, provided he sees that it is a difficult case. So far, these authority records have contributed to the improvement of the quality of the new data.

Also, they save work for the cataloguer since there is no longer any use inputting the variant forms. You just input the authorized form. Some cataloguers may argue that the variant found in the item should be input into the bibliographical record for that item as some kind of an entry, ie into the 9xx area with the present handling of those tags, but that stand is no longer the preferred choice.

An ordinary library user, a patron, may start to wonder what all these bogus records are about, or he will just disregard them. Of course, if a title that should be found under one form of a name just is not there, the idea may come up that it should be sought under another form of the name, and with proper instructions, the patron may come to using the authority record as a list of hints, what other forms could be used. So far, it is far from certain that the patrons can manage that - at least, they must be taught, and dependent on subjects, a patron will use this more or less often and become more or less used to it.

Instead, there is one enormous challenge in all this, that should be investigated in the near future. This truly cooperative effort has laid the necessary prerequisites for a major lift of data quality, to be performed when we feel confident that we have this kind of makeshift authority records for a majority of all difficult personal and corporate names in the base.

We can use machine-supported mapping and amalgamation, in order to introduce proper authority technique into the file.

- We should convert these authority records back to standard.
- Then, any 1xx/7xx tag in each bibliographical record should be compared with the authority file, and in case of a match, the data from the authority record should replace the older data in the record, or rather, the record should be linked to the authority record and the corresponding 1xx/7xx tags be deleted.

- In case of no match, which means that the individual in question is not covered by any authority record, we could assume that the name is found just in one record, or that all occurrences of the name are consistent in respect to the form. Then, a simple authority record can be built from that form.
- In cases of near matches, or mismatches, you would have to get a report out of what could be done, but let a human authority decide, and to decide what is a match, a nearmatch or a suspected mismatch is the difficult part of the preparations.

This would mean that you converted this fairly old-fashioned bibliographical file into something that is closer to a relational structure, with separate authority records linked to the bibliographical ones, and that this would be done using authority records emanating from active library cataloguing using the same technique. The uploading of authority records from the VTLS library systems took some money to develop, and this next phase will not cost less, but if it can contribute to making the today 4 M records file of LIBRIS a better partner for libraries and their patrons, it is very well worth doing it.

Anyway, the beginning is done by the present activity. Without it, the amalgamation would have been much tougher, and the makeshift records do a good job in the meantime.

Integrating Images into the OPAC : Issues in Distributed Multimedia Libraries

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Prior to her work in Switzerland she worked as a visiting scholar at the Library of Congress.

She has an MA in American Studies and Library Science and a PhD in Information Science from the Free University Berlin.

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Abstract

Most of the technologies required to develop multimedia information systems are now in place.

We will present such a multimedia workstation which handles video, audio, text and graphics in an integrated manner. The VTLS InfoStation offers a standard environment which supports library applications and integrates multimedia into the library's OPAC.

A subject search in an OPAC, for example, no longer has to end with the retrieval of bibliographic records alone. Moving beyond the bibliographic description a topic can be presented in a multidimensional way.

The InfoStation allows to share digital library collections through a network. Thus, distributed collections of various media can be accessed through the Internet and viewed at the user's workstation.

Technical aspects as well as management issues in setting up a multimedia environment will be discussed.

Libraries and Multimedia

During the last days networks were discussed and a lot was heard about electronic information. But as we all know the majority of our holdings is not yet in digital form. Above all our special collections become more and inaccessible due to their size and their fragile condition. To introduce our presentation about the VTLS InfoStation let me give you an inside view from a national library and how we plan to use a multimedia workstation for better access to our special collections.

Multimedia already made it to the frontpages of Newsweek and the New York Times. Now, even the Economist has picked up on the multimedia fever. By multimedia the newspapers mean a partnership of technology and commerce as can be seen in the recent merger between Bell Atlantic and

TCI, a cable TV company. Multimedia is on one hand the convergence of three ordinary technologies:

1) the telephone
2) the television
3) and the computer.

On the other it is the convergence of four very different media all of which have been around for a long time. Multimedia as it applies to libraries is the possibility to simultaneously view:

1) text
2) sound
3) still graphics
4) and full motion video.

By making part of their collections available in multimedia format libraries can offer new access points as well as a new quality of access. This will open perspectives to the researchers that have not been available before.

Yet, the hype about the new information highways and the use of buzzwords like information society - the Economist even talks about the age of multimedia - often overlook that some of the institutions which have been handling information for thousands of years are almost about to drop out of the race.

Despite networks, automation and a lot of talk about document delivery services, for example, European national libraries by and large are still fairly closed institutions. What do I mean by this? Well, let's step back into history for a second:

Before the Alexandrian era, knowledge had been to a great extent regional, but with the creation of the Alexandrina as the first universal library in the history of mankind, knowledge too, at once became universal.[1] At that time a feature of most Hellenistic cities was a public library. Polybius, for example, who lived in the second century B.C. took this phenomenon for granted and wrote: "It is no difficult task to write from books provided one resides in a city well equipped with archives and a library."[2]

Not a thousand years ago but only two weeks ago I heard very similar words. During a meeting which discussed the recent restrictions in circulation at my library, staff argued that the users could very well come to the library, especially in such a small country as Switzerland.

So what is going on in national libraries? I seem to notice a trend in restrictions of access to the collections. For illustration let me give you just some examples of what some national libraries do today:

1) This spring, the Library of Congress closed it's stacks to most of its staff.[1] The Biblioteca Nazionale in Florence also recently closed its stacks to staff.
2) In September, the Swiss National Library announced that it will no longer circulate books published before 1951. The restriction includes interlibrary loan. From now on readers have to come to the library for these materials.
3) The French Bibliothèque Nationale was never a lending library to begin with.
4) The Deutsche Bibliothek in Frankfurt has a limited circulation and under restricted conditions (according to the German interlibrary loan rules) though they get two copies through their legal deposit.
5) And to conclude, the trend does not stop at national libraries: at least two university libraries in Switzerland have stopped interlibrary loan of recently published books.

And mind you all this is going on while we here talk about sharing resources over networks, how to transform our institutions into information centers and how to create virtual libraries. Where is the connecting link ?

Preservation specialists argue that the paper is too brittle and the damage on books caused by users contradicts the library's task to safeguard the collections. Library managers on the other hand argue that theft from users and unfortunately librarians alike forces us to close access to the books. Both arguments can be justified. In addition, two major interest groups are active in the library:

In one corner of the library, information and computer specialists are busily automating the library. They install integrated library systems with sophisticated OPACs and open their databases to the world on the Internet. But keep in mind that up to now most of the databases consist of bibliographic records and not much more. I am certain that this will change in the future though.

On the other side of the library, the preservation office and the managers emphasize the archival role of our institutions. Usually the two parties do not communicate well. The information specialists and reference librarians go out to conferences and present their wonderful ideas to an audience of other information specialists. But the picture of openness and communication we draw seems to be constantly painted over by the protectors in our home institutions. Whichever side is right is not the issue here at all, please do not misunderstand me.

But there is a third party which often we tend to forget when the two adversaries fight in meetings. The user, remember him or her?

And for the user a bibliographic record signifies simply an aid. For the librarian it is often the end in itself. But a user wants access to the material, the content itself. Her research question might be about Mozart, that is his music and his life and not about a bibliographic record. Now, with a multimedia workstation it becomes possible to present the user with letters, music and a biography of Mozart at the same time offering a compromise to the above mentioned non-communicating parties. Digitized versions of special collections, that is surrogates, can be made available through systems like the VTLS InfoStation. Since we simply can no longer expect each and every researcher to travel the world from library to library in order to do his research remote collections can even be made available through the Internet. Even though you might argue that the needed bandwidth of the networks is not there yet it will come in foreseeable time. For instance, digital video broadcasting over the Internet is being developed right now by Xerox and others, and this spring the first film was sent through the net.[4]

Yet many think that multimedia is a popular craze which will probably be crushed by it's own technical complexities.

When the following requirements are met this should not happen.

In a library we need :

- technology which conforms to international standards;
- optical storage products which are archivally proven;
- automatic recopying procedures should degradation occur;
- scanning equipment which can handle fragile library material and bound volumes.

Three major aspects need to be identified when thinking how to apply multimedia in libraries: The digitization of material results in a surrogate of the original. The InfoStation integrates the digital images - be it video, graphics, or full text - into the library's OPAC, that is the MARC record is used as a basis.

Now what do we do currently at the Swiss National Library?

Our library is being automated using the VTLS system. For our national archive on Swiss literature as well as for the graphics division to simply catalog their collections in the form of a MARC record is insufficient. Therefore, we have just started a project to digitize part of the Friedrich Dürrenmatt papers. The collection consists of manuscripts, photographs, some videos, interviews on tape and some black and white drawings. By using the VTLS InfoStation on a 486 machine running Nextstep we will integrate this multimedia collection to the library's catalog using the USMARC format as a basis.

Questions about storage, image quality, retrieval options, output formats and of course copyright will have to be answered by this pilot project.

Design work for a multimedia project is slightly different than that for an average computer project. Therefore, before starting work with the VTLS InfoStation which will be described in detail below, planning was undertaken according to the following procedures:

1. Define Requirements

   Usually, the special collections librarian knows what an application needs to do. But for multimedia, because the technology is unfamiliar, requirements are difficult to define and time frames are greatly underestimated.

2. Justify the Flashing Lights

   Each image, sound piece and video sequence has to be justified. Computer exhibits too often present flashy multimedia products which display too much multimedia and too little useful application, what a consultant called "the Christmas tree look".

3. Begin Development

   Analysis, design, prototype as done in other projects. With the exception of some additional steps though.

4. Design

   Definition of media content, application flow chart of each media component.

5. Development

   Creation of a master storyboard, screen design.

6. Media Production

   Production of video, audio, still photography, graphics and still art, editing.

7. Authoring

   This is the assembling of the various types of media, the timing of the application and the script.

8. Testing

   User testing, system functions, interface design, usability.

The VTLS InfoStation™: An OPAC-based Multimedia Access System

What is the VTLS InfoStation?

The VTLS InfoStation is a multimedia information and access system that serves as a front end to online public access catalogs operating on mainframes and minicomputers. As a graphical user interface, it allows users to search and retrieve items with the click of a mouse button. No commands are needed. The InfoStation features hypermedia links, and text and graphics note pads, enabling the user to author and annotate multimedia files and link them to other full-text documents, images and CD-quality sound.

Goal

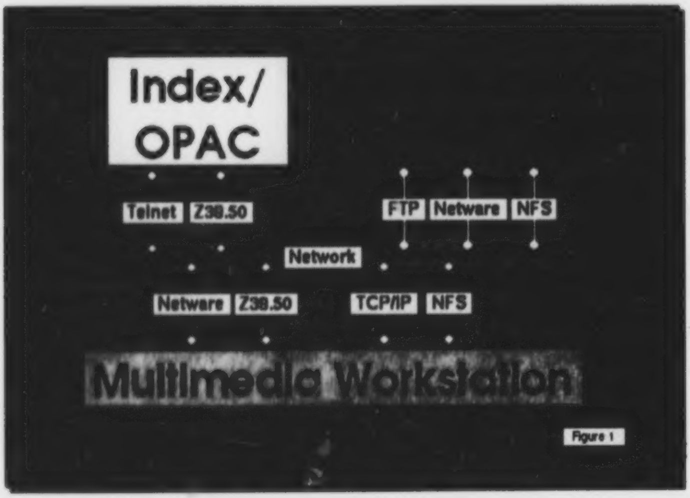
The development of the InfoStation was based on the following goal:

- To create a scholar's workstation for the multimedia, virtual library, using the existing framework of online public access catalogs to organize and manage multimedia information.

Access

The InfoStation is, above all, an information access system. Based on the client/server computing model, it allows users to access multimedia information from any server, whether local or remote. In fact, with the InfoStation, a user can access up to 64 online catalogs, and with a click of the mouse issue a search command to all of them simultaneously.

The InfoStation provides connections to multiple, distributed databases via TCP/IP protocol and provides access to multimedia objects on the network via NFS^{R}, FTP and Novell NetWare^{R}. Support of the Z39.50 standard is in development (see **Figure 1**).



What are the Primary Features of the InfoStation?

- Three different search options:
  - icon and menu-based searching using the graphical user-friendly interface, which features windows, mouse support and voice alerts
  - direct entry of commands
  - natural language commands which are managed by a built-in, back-end expert system.
- Authoring and retrieval of full-text documents, TIFF and Postscript images, CD-quality digitized sound, photo-CDs and full-motion video.
- Hypermedia linking between full-text documents, sound recordings and images, or other database searches.
- Annotation of files containing full text and images through the use of text and graphics note pads.

- A text-to-speech facility that can "read" text as it is displayed on the screen.
- Integration with word processors, electronic dictionaries, image scanners, OCR, and other software programs.

Applications for the InfoStation in Academic, Public and Special Libraries

- Scholarly research
- Children's room
- Slide and photographic collections
- Music collections
- Speeches and other oral history recordings
- Rare materials and archives
- Image management
- Reference and non-circulating items

Equipment

The VTLS InfoStation runs under NEXTSTEP® on computers using Intel 486 processors and also on NeXT computers. Plans are to port the software to Sun™ SPARCstations™, Hewlett-Packard Apollo Series-700 workstations and other UNIX® machines.

References

1. Mostafa El-Abbadi, Life and fate of the ancient Library of Alexandria. UNESCO 1992: 16.
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3. Grace Palladino, Library of Congress Poses New Threats to Scholarship. The Chronicle of Higher Education, June 2, 1993: A40.
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Further Readings

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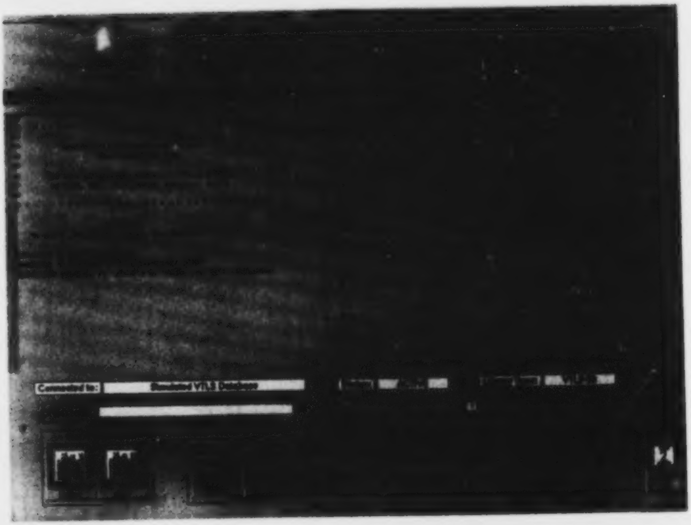
Multimedia Visualizer: An Animated Object-based OPAC (Information Technology and Libraries; Dec. 1991)

InfoStation: A Multimedia Access System for Library Automation (The Electronic Library; Vol. 8, No. 6; Dec. 1990)

Sound, Image Mark Next Information Revolution (VTLS Express; Vol. 6, No. 2; Summer 1990)

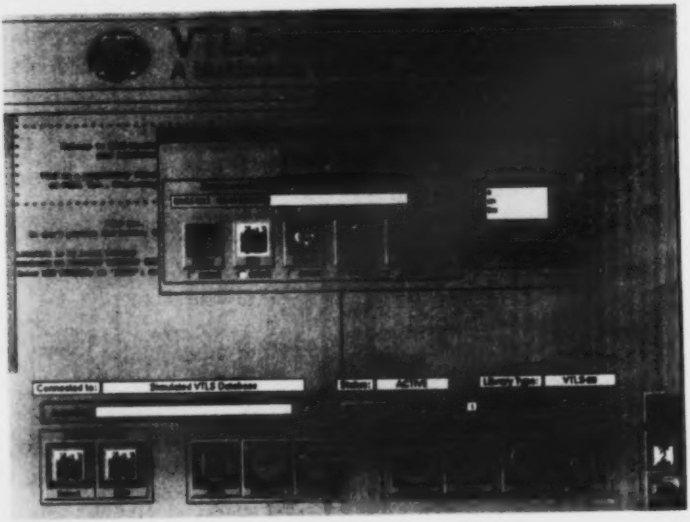
Annotated OPAC is Scholar's Dream Come True (VTLS Express; Vol. 7, No. 2; Spring 1991)

VTLS Inc.: The Company, The Products, The Services, The Vision (Library Hi Tech; Issue 42; 1993)



Connected to: Simulated VTLS Database

Screen 1



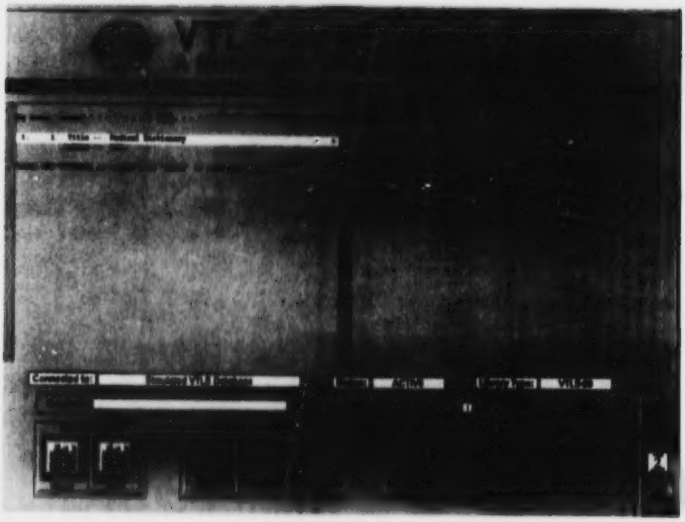
Connected to: Simulated VTLS Database

Status: ACTIVE

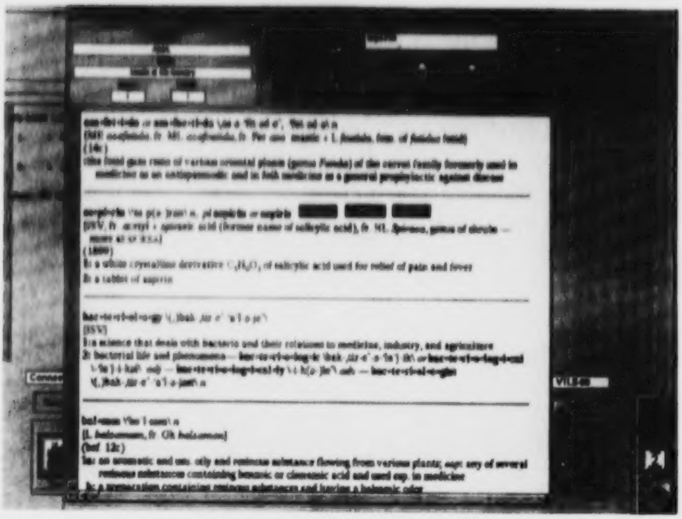
Library Type: [illegible]

Screen 2

BEST COPY AVAILABLE

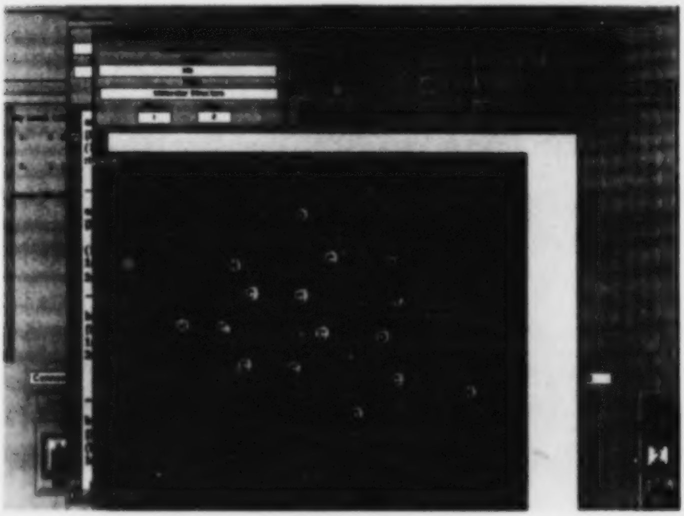


Screen 3

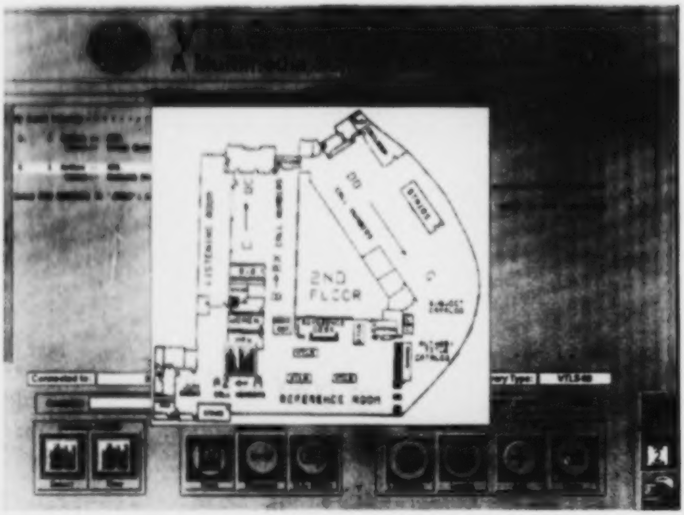


Screen 4

BEST COPY AVAILABLE

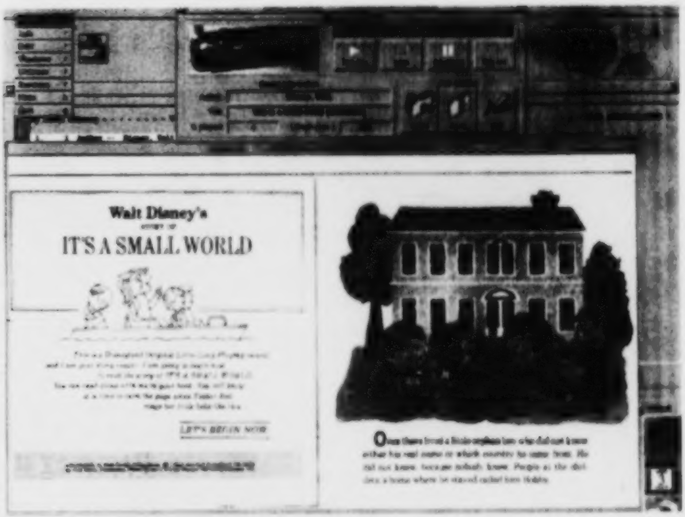


Screen 5



Screen 6

BEST COPY AVAILABLE



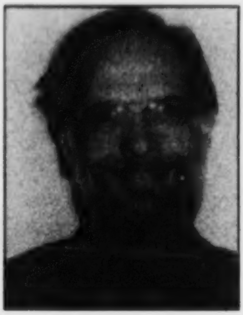
Screen 7

BEST COPY AVAILABLE

An Image is not an Object : but it can Help

David L. Austin

Architecture and Art Library, University of Illinois at Chicago,
Chicago, Illinois, U.S.A.



David L. Austin, Architecture and Art Librarian at the University of Illinois at Chicago, earned his Bachelor of Music and Master of Arts degrees from the University of Michigan. He later pursued his academic training in librarianship at the University of California, Berkeley. Previous publications of him include Henri Sauguet, A Bio-Bibliography and articles and book reviews for Art Documentation and Computers and the History of Art. His current research interest in problems related to locating prints, slides, and photographs led him to address the broad problem of access to visual information in a universal context and, more specifically, construction of an index of the Conway Library Microfiche.

Abstract

Visual information exists in academic, public and private collections, but traditional methods impede efforts to provide cooperative cataloging and access. A simplified information system which relates to both object and surrogate will enable both museum professionals and the librarians to provide information for their users.

The index structure used in a project to provide access to photographs contained in the Conway Library Microfiche is the key to shared access for both images and objects. It contains data elements extracted from USMARC and UNIMARC formats. Since all fields of information do not need to reside with the primary documentation record, the basic structure of each microfiche index record can be adapted and expanded by other users to

include information appropriate to the needs of a museum, a slide collection, a scholar, and a cultural heritage documentation project.

Vocabulary standards must also be established before such cooperation can occur. Some, such as the *Art and Architecture Thesaurus*, are either nearing completion or under development at this time; others still need to be addressed. An effective system to provide access to both object and image must also take into account language differences, variant titles, variant spellings, and variant attributions.

Introduction

During the twentieth century libraries strove to provide increasing amounts of information faster and in a more consistent fashion for a greater number of users. The work undertaken to achieve our goals rarely decreased our workloads. Accord on national and international standards for bibliographic description, and implementation of MAchine Readable Cataloging (MARC) enabled libraries to share cataloging chores faster and more conveniently. Catalogers of non-bibliographic items, such as music scores and sound recordings, saw the advantage of shared cataloging and followed the lead of book catalogers.

During the last quarter of this century, in response to our need to streamline and economize, integrated systems, such as NOTIS (Northwestern Online Total Integrated System), sprang up to tie together all our operations, from ordering to cataloging to circulation. Such systems incorporate a library user component, referred to as an Online Public Access Catalog (OPAC), which eliminates the time and expense of filing cards in cabinets.

Over the last decade many librarians, particularly those in the public service or the reference sector, have addressed the issue of how our users interact with OPACs. They attempt to find answers to: how much information is enough to find a book; what should that information look like to the user; can other database indexes be integrated into the OPAC; will this make information-seeking easier for our patrons; all in an effort to fashion the ideal interface between users and the information they seek. This is done, particularly if we are part of a public education system, to reach the greatest number of our users. As a result, we focus on the needs of the lowest common denominator of library user when building collections and information systems.

We need to remember that our libraries also exist to serve the needs of more sophisticated library and archive users. I refer, in particular, to the humanities student and scholar who "study the creative works of men and women, [which] include entities and phenomena that exist in space and time..."[1] As a consequence of our splendid efforts to serve the general user we have distanced ourselves from many scholars. Some openly reject libraries and the services that they offer;[2] others claim that the kind of reference service they encounter in libraries has little to offer them.[3]

Librarians, in their turn, often counter charge that those in the humanities lack computer literacy skills, but I suspect, in many cases, that those in the humanities fail to use libraries and their services because we offer them so little. For example, although we know that they desire access to images,[4] we perform this service very badly for them. As a partial remedy to the situation I want to present to you a possible solution to this information need of theirs. At the same time, I want to outline the careful foundation necessary to accomplish the task. Since others have addressed the problems humanists confront when seeking access to verbal information they need,[5] I will limit my remarks to the non-verbal documents of the humanities, particularly the artifacts of our culture.

Images and Objects in Information Collections

The top portion of **figure 1** illustrates the variety of information housed in museums. Given that fewer than ten percent of the Europe's museums have implemented some kind of computer system to document their collections,[6] we may conclude that they are notably less aggressive than libraries in applying electronic technology, but the issue of inventory control and shared access to information about objects and images does not lack advocates in the museum community.[7] The work of the Museum Documentation Association,[8] and the International Documentation Committee of the International Council of Museums and the working group on Computerized Interchange of Museum Information (CIMI) of the Museum Computer Network will encourage museums to communicate with each other and share information in a way similar to that enjoyed by libraries.

The middle portion of **figure 1** demonstrates that visual resources collections often obtain many of their slides and photographs from museums. Objectives of the two institutions are comparable, but the information contained in a visual resource collection is a step removed from the object.

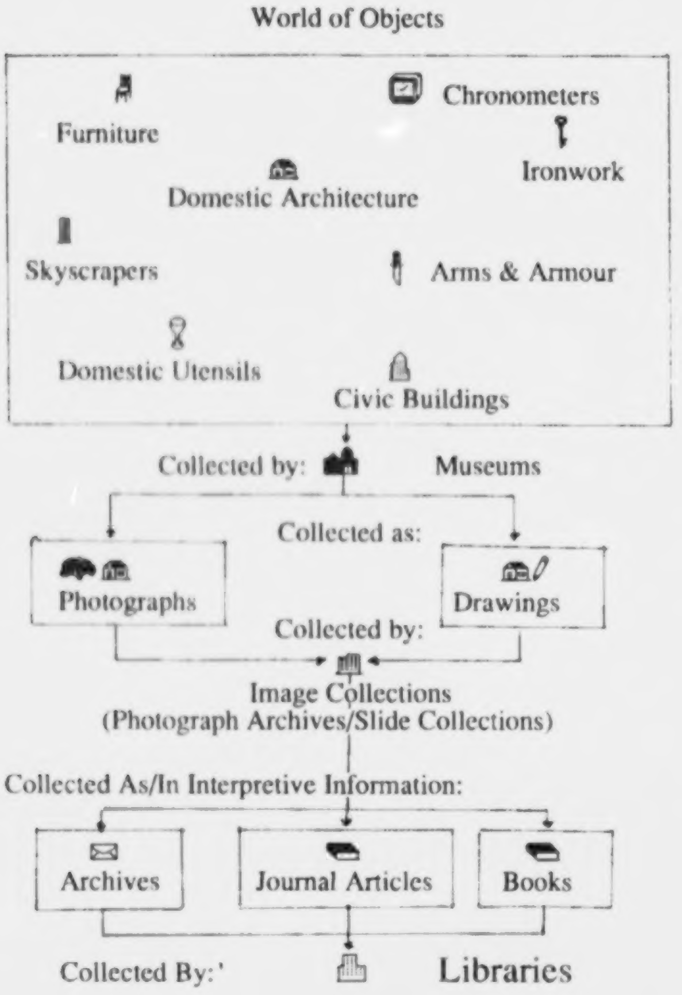

World of Objects
Furniture
Chronometers
Ironwork
Domestic Architecture
Skyscrapers
Arms & Armour
Domestic Utensils
Civic Buildings
Collected by:
Museums
Collected as:
Photographs
Drawings
Collected by:
Image Collections
(Photograph Archives/Slide Collections)
Collected As/In Interpretive Information:
Archives
Journal Articles
Books
Collected By:'
Libraries

Figure 1

Many library collections also contain a variety of pictorial reproductions, including photographs, prints, and slides. Such pictures may be located in the archival or special collection section of the library. They may also result from pictures cut from magazines and books, pasted on mounting board, and placed in a file cabinet for the use of patrons. Collections frequently grow up in response to the needs of academic departments and are independent of the library.

Few of these collections are indexed in any detail, although 3 x 5 card files or in-house database indexes may help to provide access to the images. More often their care and management is left to the off hours whenever anyone has a moment to spare. Intricate and sometimes arcane systems of filing result, especially at institutions which boast long histories of collecting, and where numerous librarians, curators, or volunteers contribute to the organization of the cabinets.

The bottom portion of **figure 1** shows that the study of objects and images of objects results in interpretive studies which are housed in libraries. The studies may be even farther removed from the realm of the artifact, but bibliographic collections are the best places to seek out comprehensive interpretive studies.

How do these three levels of collections relate to each other? Essentially they all exist to provide access to information for patrons or visitors. The level of information sought by the patron determines what kind of institution the person visits. One usually assumes that the source closest to the object or artifact provides access to more detailed factual data about a single object. Before a scholar can examine an object or information about it, including graphic or photographic representations of it, the object must acquire an acceptable descriptive label.

Printed materials now arrive at our libraries conveniently supplied with authors, titles, publication information, and ISBNs. Often they contain Cataloging In Publication (CIP) data, but this is rarely the case with artifacts found in museums or photographs in our slide collections. In order to provide comprehensive access to objects and their surrogates, similar to that which benefits the users of verbal documents, information managers must devise a cooperative plan which will encourage libraries, museums, and photograph collections to work hand in hand. What kind of information will enable each of the three collections to share the workload which will make access to information easier for all?

Organizing Access to an Image Collection

I would like to digress for a moment to describe a picture archive with which you might not be familiar. For the last two years my research concentrated on planning a database index to provide access to information pictured on the microfiche version of the Conway Library which is located at the Courtauld Institute of Art in London.

Sir Martin Conway (Lord Conway of Allington), connoisseur, art critic, lecturer, explorer, and politician, began collecting pictures of art works in a casual way during the last decades of the nineteenth century. In 1902 he set about his task in a more systematic way and eventually decided to focus his efforts on photographs and prints of architecture, sculpture, and the decorative arts of all kinds. His decision to exclude painting and drawings allowed him to focus his collecting energies within narrower limits, and therefore to build a larger, more specialized library.

In his effort to build a comprehensive collection, he sought out and purchased commercially available photographs, view cards, and postcards. He also bought stock-in-trade from the estates of dealers, sought out sale and exhibition catalogs, and the accumulated scholarly treasures of antiquarians and other collectors. If a book or magazine contained a picture of value to his collection, he cut it out, mounted it on heavy stock and added it to his collection. If illustrations appeared on both sides of the pages, he purchased two copies and usually discarded the textual content. Finally, in his effort to intensify coverage of his collection he attempted to purchase every great publication issued before World War I.

In 1931 he presented his collection to the University of London where it, like the better known Witt Library, came under the administration of the Courtauld Institute of Art. The number of photographs has since continued to increase through purchase, staff photographic expeditions, and donations from scholars and other collectors. Other great visual resources comparable to it are the Avery Library, the Photoarchiv Marburg, and the Alinari Archive. Currently it contains approximately one million images and ranks as one of the most important international research collections for the study of architecture and art history, and, more recently, for the growing number of those who rely upon visual information to supplement their studies and illustrate their research.

The organization of its contents follows the pattern established by its founder. Standard size pamphlet boxes contain the mounted photographs.

Occasionally a periodical article, brochure, or detailed guide book will be interfiled among the photographs to which it is related. The boxed photographs are arranged on shelves by category: architecture, architectural drawings, sculpture, medieval arts and manuscripts. A brief overview of the collection shows that subdivision by country and general time period roughly begins the sorting process for photographs of architecture and sculpture. Cathedral structures (listed alphabetically by site), followed by other sacred establishments, such as monasteries, and then by secular buildings (grouped alphabetically by city or county) establish further internal organization for architecture of England, Scotland, Wales and Ireland. For the rest of the world, city or district site is subdivided into sacred and secular buildings which are listed alphabetically by name. Architectural drawings and sculpture subdivide into anonymous works followed by those with named artists (once again arranged alphabetically). The pattern of organization for medieval arts begins with a generic typological division (ie, pietàs, wall paintings, ironworks, etc) and time period. Once again anonymous works precede works by those of known artists and craftsmen.

The organization described above serves students and staff of the Courtauld Institute of Art and suits the needs of those who visit the library where the staff will assist them. Emmett Publishing's microfiche version of the Conway Library changed all that when it appeared in 1987. Those seeking visual information about architecture and art objects outside the library in London will now find the collection more accessible, but locating specific items within it is difficult without the help of the staff, just as it would be for a museum whose staff was not present.

Consider, for the moment, the approximately 1,000,000 images on the Conway Library microfiche. How can we provide access to them? Several choices lay at hand; each one may be more appropriate for one kind of institution than another. For example, a library may choose to present the Conway Library microfiche as a bibliographic unit as in **figure 2.** This version of information access tells us only that a collection of illustration held by a library in London contains photographs of architecture, architectural drawings, sculpture, medieval arts and manuscripts.

If one chooses to provide access to smaller batches of photographs associated with a single object, MARC-AMC and MARC-VM provide formats for archives and manuscripts control, and visual materials, respectively. Likewise, the Universal Bibliographic Control and International MARC Programme of IFLA provides guideline for the description of

Single Unit Bibliographic Cataloging of Conway Library Microfiche

Author (Corporate): **Conway Library.**

Title: **The Conway Library, the Courtauld Institute of Art : microfiche copies of materials in the collection.**

Place/Publisher/Date: **Haslemere, Surrey : Emmett Publishing, 1987-**

Description: **6 parts in 6,979 microfiches : all illus.**

Notes: **Accompanied by printed index.**

Contents: **Contents: pt. 1. Architecture, fiche 1-1511. France and Italy---pt. 2. Architecture, fiche 1-1590. British Isles and the Rest of the World---pt.3. Architectural Drawings, fiche 1-408--pt. 4. Sculpture, fiche 1-1417---pt. 5. Medieval Arts, fiche 1-1092---pt. 6. Manuscripts, fiche 1-961.**

Subject: **Conway, William Martin, Sir, 1856-1937. Photograph Collection.**

Subject: **Photograph Collections--England--London.**

Figure 2

component parts which fit within the structure of the International Standard Bibliographic Description for non-book materials. **Figure 3** illustrates this method.

Batch-Level Cataloging of Images Related to Single Structure in the Conway Library

Agent:	**Robert de Luzarches, Architect, fl. early 13th Century.**
Uniform Title:	**Cathedrale Notre-Dame.**
Title:	**Amiens Cathedral . [visual material]**
Place, date:	**France ; Somme ; Amiens : 13th Century.**
Description:	**Plans, Drawings, Articles, Photographs; some bibliographical references.**
Contents:	**6 plans ; 8 elevations ; 9 drawings ; 615 exterior views ; 132 interior views.**
Note:	**Work on the cathedral continued by Thomas de Cormont, then Regnault de Cormont.**
Note:	**Contains 1 article: "Some French Cathedrals. IV. Amiens." *Times*, 24 August, 1912.**
Subject:	**Cathedrals--Drawings.**
Subject:	**Cathedrals--Photographs.**
Added Agent:	**Thomas de Cormont, Architect, fl. mid 13th Century.**
Added Agent:	**Regnault de Cormont, Architect, fl. mid-late 13th Century.**
Host Item Entry:	**Conway Library Microfiche. Part 1, fiche 14, frame 31--Part 1, fiche 21, frame 71.**

Figure 3

Batch cataloging will not solve the problem of providing access to the photographs of component parts of complex architectural structures. A person seeking this kind of information benefits more from detailed cataloging, as in **figure 4**, which tells him that some photographs which show the quatrefoils on the socles along side the portals of the West Front exist in the collection. Detailed photographs of the socles show relief sculpture depicting scenes from the Bible and lessons of the church. Nor will batch cataloging provide access to single copy photographs of pictures of smaller individual objects, such as statues and medieval ivory crucifixes. Library users who seek such specific data benefit more from museum or rare book type cataloging which typically deals with unique materials.

Item-Level Cataloging of an Image in the
Conway Library

Agent:	**Robert de Luzarches, Architect, fl. early 13th Century.**
Uniform Title:	**Cathedrale Notre-Dame.**
Title:	**Amiens Cathedral [exterior] : West Front: Central Portal : North Side : Socle : Quatrefoil. [visual material]**
Place, date:	**France ; Somme ; Amiens : 13th Century.**
Description:	**1 b & w Photograph.**
Note:	**Work on the cathedral continued by Thomas de Cormont, then Regnault de Cormont.**
Note:	**Relief carving depicts the Virtue "Hope"**
Subject:	**Cathedrals--Photographs.**
Subject:	**Cardinal Virtues--Hope.**
Subject:	**Cathedrals, Central Portals, Socles, Bas-relief.**
Added Agent:	**Thomas de Cormont, Architect, fl. mid 13th Century.**
Added Agent:	**Regnault de Cormont, Architect, fl. mid-late 13th Century.**
Host Item Entry:	**Conway Library Microfiche. Part 1, fiche 18, frame 18.**

Figure 4

Relationship of Image and Object Cataloging to Bibliographic Cataloging

An analysis of 2% of the images in the Conway Library revealed that only nine basic data fields were needed to provide access to the images and their pictorial content. They include: object name, personal name, object site, object date, form of representation, source of representation, subject access to the object, microfiche location of the image, and, occasionally, a memo field. Let us consider the fields which apply equally to museums, image collections, and libraries (ie, object name, personal name, object site, object date, and subject access) and compare them to the results of a 1991 survey of large bibliographic agencies' which recommended only a few mandatory and optional fields of information necessary for the agencies to achieve a mutually agreeable minimal level standard for describing bibliographic information. **Figure 5** summarizes the findings of the survey.

Proposed mandatory and optional data elements in a
Minimal Level Bibliographic Description

Element	Recommendation
Title Proper	Mandatory
Parallel Title	Mandatory
Other Title Information	Mandatory
Statement of Responsibility	Mandatory
Edition Statement	Mandatory
Additional Edition Statement	Mandatory
Place of Publication	Mandatory
Name of Publisher	Mandatory
Date of Publication	Mandatory
Extent	Mandatory
Illustration Statement	Optional
Dimensions	Optional
Series Title	Mandatory
Series Parallel Title	Optional
Series Numbering	Mandatory
Standard Number	Mandatory

Figure 5

Data elements such as title proper, parallel title, other title information, and statement of responsibility can clearly be seen as information elements also applicable to the organization of objects. Elements related to edition and series are less applicable, except in those cases where replications of the original (ie, casts or prints) exists. If the term "manufacture" or "construction" replaces the term "publication," the third group of elements is equally applicable to man-made objects. Scholars will find a museum's accession number or a reference number from a *catalogue raisonée* more useful than a standard publication number.

The format used in constructing the Conway Library Microfiche Index parallels the minimal level cataloging approach for bibliographic materials and is a step toward a cooperative database for museums and libraries. Its simplicity allows flexibility in a way that traditional, full level cataloging cannot. Cataloging records of this kind result in economic benefits for those who originate them, since they take fewer man-hours to produce. They also provide a framework for those who share them after the point of origin; they may expand and shape such records to fit the needs of their own collections.

Some institutions already attempt to provide online access to image,[10] but the one which most early achieves similar flexibility is the University of Virginia's tri-level cataloging procedure for images. **Figure 6** shows the minimal level of cataloging deemed appropriate for images at the University of Virginia. The illustration includes MARC field tagging and description.

The first level, in its current draft form, establishes the minimum level of cataloging required for all records and is provided by the library's catalogue department. The second level contains additional fields of information which visual resources catalogers at the university fill in to provide greater depth of access. Researchers are encouraged to use a third level, presumably at their own individual workstations for maximum security for their research. They may add information files, such as provenance, related literature, exhibition record, and conservation actions, appropriate for their individual projects.

The Victoria and Albert Museum also approaches its holdings in a similar additive manner with the ROLO (Recording Object Locations Online) system. After a minimum amount of information is entered as quickly as possible to establish inventory control over their vast holdings, the data will be expanded with additional information.[11]

After further revisions the models discussed here will contribute greatly to the foundation of time-saving cooperative cataloging by slide and photograph collections. It will also be a sound basis for a mutually constructed and interchangeable database for objects and their surrogates between museums, visual resources collections and libraries.

University of Virginia Minimal-Level Cataloging

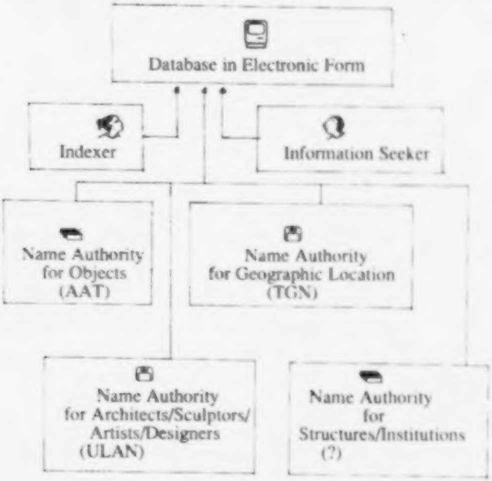
Data Element		
Artist/Designer	*100	Personal name
	*110	Corporate name
	*111	Meeting/Exhibit
Title	•245|a	Title statement
	°245|p	Subtitle/Form
Location	•245|b	Remainder of title
	°851	Location
AD Dates	*260|c	Date
BC Dates	°046	Type of date
Medium	°340	Medium
Source	°510	Citation Note
Form/genre	°655	Genre/Form
Other Features	•300	Physical description
Present location	°535	Location of original

* = Required • = Mandatory ° = Optional

Figure 6

The Need for Standards

At this symposium last year Irene Sever recommended that we expand access to other resources in our libraries. Some academic institutions already provide digitized color and black and white images online. Commercial vendors also promise to provide them in the very near future, probably in a pay-per-view form. In her conclusion Ms Sever said, "The jinn is out of its bottle and is puffing itself to a great height: what shall we command it to do?[12] If we choose to provide such materials to our users we should begin, as she recommends, to construct the access tools now. Such tools enable us to enter data in a uniform, and consistent manner and help us to educate those with information needs to ask questions in a way that a machine can answer them. **Figure 7** illustrates how such tools can help both indexers and information seekers to get the most out of a database index.


Database in Electronic Form
Indexer
Information Seeker
Name Authority for Objects (AAT)
Name Authority for Geographic Location (TGN)
Name Authority for Architects/Sculptors/ Artists/Designers (ULAN)
Name Authority for Structures/Institutions (?)

AAT = Art and Architecture Thesaurus
TGN = Thesaurus of Geographic Names
ULAN = Union List of Artists' Names
Projects sponsored by the Getty Art History Information Program
? = Yet to be Constructed

Figure 7

Some names of people required to provide access to the objects and their surrogates already exist in authority files on the United States Library of Congress and the Avery Library. The *Union List of Artists Names (ULAN)*, soon to be released by the Getty Art History Information Program, will also prove helpful, although further cooperative authority work to determine a preferred form of a name and variants of that name will be necessary in the future. Names of a patron or the subject of a sculptural monument are important, especially to a researcher from a discipline other than architecture or art and should be treated as points of access of equal importance as the names of the creators of an artifact. Data fields for personal names should therefore include a subfield for an occupation title or role name which relates the person to the object. Occupation titles and role names may be found in the controlled vocabulary of the *Art and Architecture Thesaurus* (AAT).

Standard identification of an object's site is important to include, particularly when the object bears a frequently used name, such as Notre Dame, Saint Mary's, or Santa Maria. Location is also important to distinguish for objects smaller than buildings, since they may have migrated from their original locations. The practice of listing locations in a hierarchical manner, as set forth in Getty Art History Information Program's "Thesaurus of Geographic Names," helps avoid confusion between places with the same or similar names, such as Toledo, in Nuevo Castilla, España, and Toledo, in Ohio, USA.

Standard access can be provided to images in a collection by topical means just as it is for printed material. Terms selected from the hierarchies of the various facets of the *Art and Architecture Thesaurus* provide several advantages for subject retrieval of image content. First of all, the AAT provides consistency for both index constructors and for index users through a controlled vocabulary. Its hierarchical structure reflects the arrangement, whole to part, and general to specific, of the many visual information collections. Solid support in North America and growing recognition by major documentation centers in England and on the continent indicate that those who apply the terminology see its advantages. Efforts to construct a multilingual version will expand its usefulness. Even the differences between American English and Anglo English terms and spelling are recognized by the *Thesaurus*, and appropriate alternates are provided to satisfy the needs of those two user communities.

Date fields for art works need to tolerate a kind of vagueness, since objects are not always presented to us in nice tidy packages like printed materials.

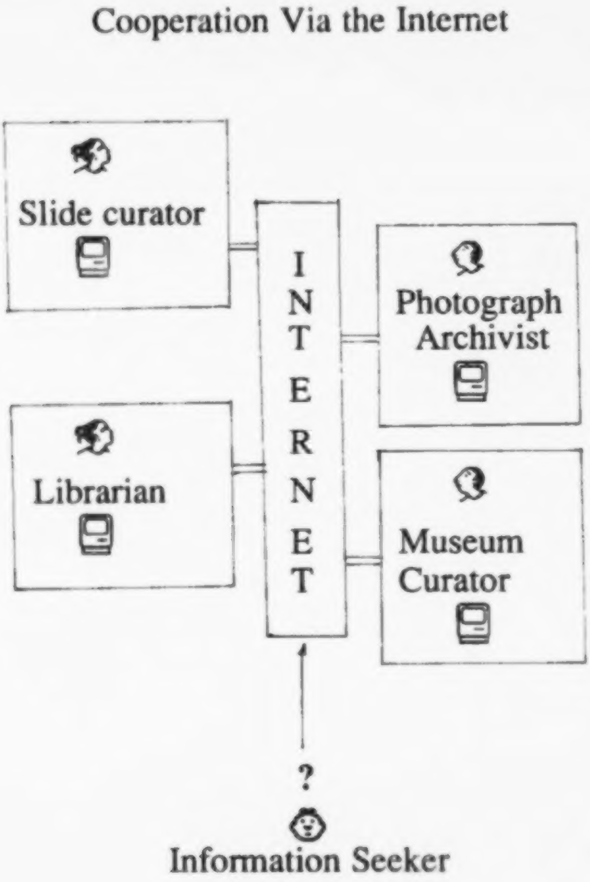
Construction of cathedrals may span several centuries, dates of other objects may be deduced only through a knowledge of a craftsman's career, or we may only be able to attribute a general date or span of dates based on stylistic comparison. Specific dates are of relative importance, but they may be subject to future modification and even correction.

The greatest problem I encountered while constructing the microfiche index was the lack of a standard related to the naming of the products of our cultural environment. In terms of the well controlled world of bibliography, what is the title of a building, a piece of sculpture or an ivory crucifix? What good is access to objects and images if those who provide them and those who seek them cannot agree upon what to call them? A practical solution to the problem is the addition of a uniform title (USMARC fields 130 or 240), especially for those objects to which an artist or designer cannot be assigned.

Some labels from which we might choose can be found in the Library of Congress Subject Authority File, but this standardizing mechanism supplies titles only for structures about which someone has written. It is not likely to contain structures such as the Luynes Château or the Église Saint-Saveur at Luz. For such objects we should rely upon standard sources, such as Nikolaus Pevsner's *Building of England* series, the volumes of the *Guida d'Italia* published by the Touring Club Italiano, the *Dictionnaire des Églises de France*, or Georg Dehio's *Handbuch der Deutschen Kunstdenkmäler*. Occasionally, a generic term, such as "medal" or "pulpit" need to be used as the object name, since no other label may be available for an object. Without such a controlling factor all images related to a single creative work cannot be drawn together for the benefit of an information seeker.

The Internet is an ideal vehicle to build a cooperative authority file for the identification of the objects and artifacts of our culture. Within a yet hypothetical structure institutions concerned with objects and surrogates could contribute their documented versions of names and places to a single host address where they would be inserted at appropriate points. No editorial interference would be imposed on the contributions since humanities studies often tend to be influenced by philosophical or national biases. The resultant fluid and dynamic "authority" file would act more as a linked cross-reference thesaurus.

The Internet is also the ideal cooperative storehouse of minimal level cataloging for objects and images. Let us look at one final information model, **figure 8,** which illustrates how uniform minimal level cataloging of visual information can extend the atmosphere of cooperation between museums and all kinds of libraries. In an ideal world such information could be provided world-wide as a free resource on the Internet. The result of such cooperation will lighten all our work loads and provide our more sophisticated patrons with a wealth of information.



Cooperation Via the Internet

Figure 8

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Resource Sharing : New Technologies as a Must for Universal Availability of Information

Conference Summary

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It was an honor to be asked to sum up the 16th International Essen Symposium. It was doubly an honor, because the Symposium celebrated Hans-Peter Geh, a famous and illustrious person in the worldwide library community. The entire Symposium was indeed worthy of Hans-Peter Geh, in every aspect, and there were many aspects.

There were two talks by Ahmed Helal, one summing-up, 23 papers (of which one was read by another person, and a panel session substituted for another), 13 discussion periods, 9 coffee breaks, 3 receptions, and continuous vendor presentations. As an aside, I can say that, having attended about 10 of the 16 Symposia, without exception they have been superbly organized, the papers always well-presented and topical, the discussions always lively and often provocative, the receptions and evening entertainment outstanding, and in general, the Essen Symposium is the most interesting and valuable conference I attend in any given year.

This year's Symposium topic was "Resource Sharing : New Technologies as a Must for Universal Availability of Information". This is an exceptionally timely topic, and all speakers/panels, addressed it in diverse, but always interesting and enlightening, ways.

We first heard Herb White. In his inimitable style, he reminded the audience that while there are certainly technological advances, which mean new and improved ways of producing documents, we are faced with a long-term process. He was one of many speakers who made the point that the technology is not yet here, and that there are many issues, not the least of which is cost, to be considered. OCLC's Janet Mitchell presented FirstSearch and the thinking behind OCLC's approach to improving access to end-users. OCLC is interested in offering delivery choices to end-users. As a major information provider, OCLC has considerable influence, and it is always interesting to find out how that organization views the market it serves through its product offerings.

Dick Dougherty was unable to be present, so a last-minute panel session was organized. This panel coopted Symposium attendees from the Netherlands, Denmark, Germany, and the USA. A lively debate was held on networking, ILL, standards, collections policies, and so on. What seems to be emerging was the constant theme and concern first addressed by Herb White: WHO PAYS?? There are conflicting problems: library budgets versus the publishers' prices; copyright issues; and the efforts of commercial hardware and software suppliers. These are worrying issues, with no clear way through them for any of the parties.

We had, variously, examples of the issues presented at the panel session, and in papers throughout the Symposium. We heard about the UK Business Information Network and its mission to improve business performance. I made a mental note to contact them, in my role as CEO of a UK business!

There were US presentations, one from SUNY on linked catalogs and cooperative acquisitions, using Z39.50 and document delivery. There was another paper from North Texas (which was read), describing how 26 libraries were planning to cooperate in order to achieve better value for money through resource sharing. In addition, we heard about the Illinois project on evaluation of electronic resources. Other examples of activities in this area were papers on preservation and compression techniques being done at the National Library of Scotland, and the development of the Consortium of Academic Libraries in Manchester (CALIM).

The Nordic countries were well-represented, with an overview of library and information networking. Also presented was a paper on the Nordic SR-net project, with mention of a similar EEC project (in which my company, IME, is involved).

Clearly there is a great deal of activity in standards areas, and in formal or informal cooperation. Standards are always important, but not always implemented was the point made by Hartmut Walravens of the State Library of Prussian Cultural Heritage in Berlin. Further talks on standards included one on document delivery and the GEDI project. The speaker, David Buckle of OCLC, commented that standards can be very dry, and he assumed that half the audience would be asleep before he finished. Perhaps it was his comment, but no one fell asleep!

Michael McLellan of SAZTEC also emphasized standards. He made the interesting point that cooperative catalogs have unique requirements, and that "batch" conversion was appropriate, but perhaps not appreciated by libraries for fear of losing bibliographic standards.

Other speakers discussed the different issues of pricing and networks, of CD-ROMs and print publishers, and of ensuring that one considers the "now" versus the futuristic promises. I think this is an important point: it's all to easy to be swayed by glitz and glitter; "now" is always duller. But "now" works; the glitz and glitter may hide the real issues, and are frequently just surface solutions. Which brings me to the point. Let's make sure that we have the underlying structure in place before we launch ourselves into what is certainly an expensive, but not necessarily cost-effective, or even cost-beneficial, future.

The papers ended with a combination of research work in fuzzy logic, and discussions and demonstrations of multimedia projects. It was most intriguing to hear fuzzy logic being discussed as a useful and even vital component of the retrieval process. Those of us of a "certain age" will recall fuzzy logic as text-book and experimental stuff! It was also interesting to hear of real projects in the much-touted multimedia area.

What does all this mean? Let me try to draw this complex scenario together.

This is my view of what is actually happening in the library community? End-users are doing a very complicated thing, namely searching and retrieving information. And often they are doing this using the Internet, which is in itself quite complex, and not particularly helpful, as we all know.

Libraries are doing very complex purchasing and maintenance operations, in addition of course to providing access to the end-users. We add to these two very different sorts of activities, the print publishing process and the complications added to publishing by electronic suppliers. The print and electronic suppliers are sometimes in conflict, as the issues of pricing, copyright, and access methods, are far from resolved.

Then stir in the glitz and glamour of things such as PDAs, hand-writing input devices, virtual reality, GUIs, animation, voice synthesis, and so on.

Take the whole concoction, and ask that sharing be the focus. Libraries have traditionally done interlending, and participated in cooperative acquisitions and cataloging. Now, when the transport carriers are so readily available, and document delivery is closer to a reality, we have the beginnings of a real nightmare. As a concept, sharing is of course excellent. And in reality, sharing is critical, and increasingly important. But let us proceed with caution now that various electronic means make sharing that much easier.

I think we are still in exploratory mode. I think it will be some years before we are truly ready to move into a more electronic age. We are only beginning to address the serious concerns arising from the availability of electronic forms of information. We have not resolved the copyright and pricing issues. We have not resolved the delivery mechanism dilemmas. Nor have we really resolved the software issues involved in searching and retrieval. We are beginning to look at all these things, and we are at least aware of the concerns, but as many speakers pointed out, the message is clear. We are not yet prepared for true electronic resource sharing.

We need more symposia such as this one to help us focus on both the "here and now" and to point out the potential benefits, and the issues which need to be resolved. I think the prospects are wonderful, and the future views truly exciting. But they are still in the future. I'll go out on a limb - I think that future is only about 3-5 years away. That's not very far, and we have a lot of work to do.

Thank you, Dr. Helal, and all at the Essen University Library, for an exceptional Symposium.

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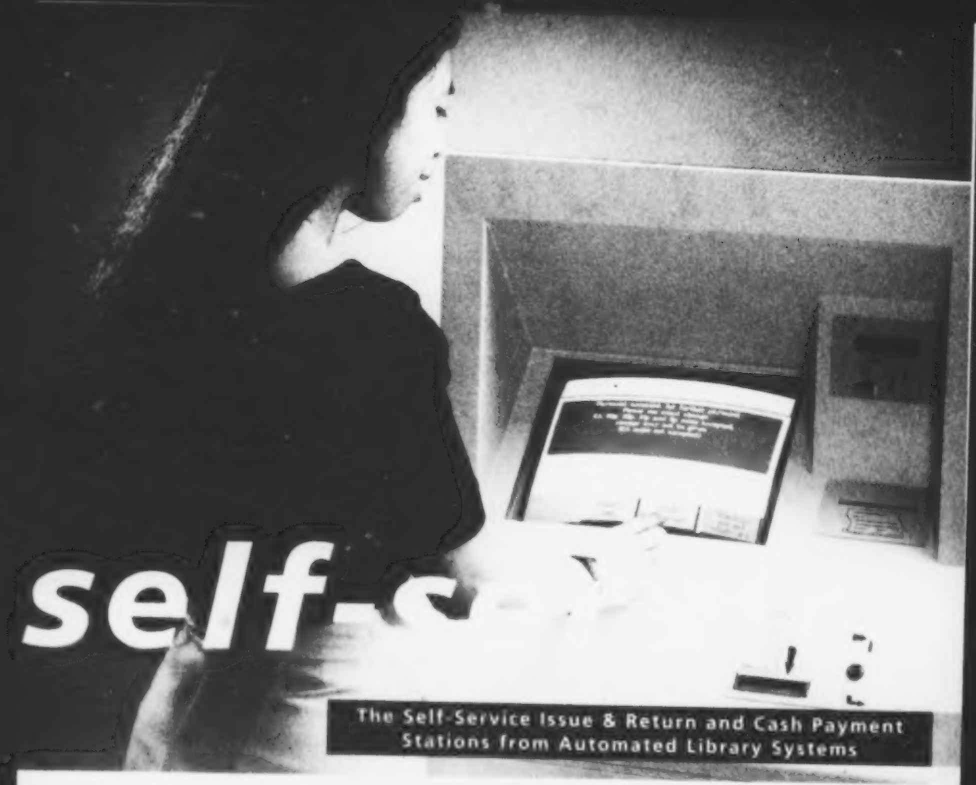

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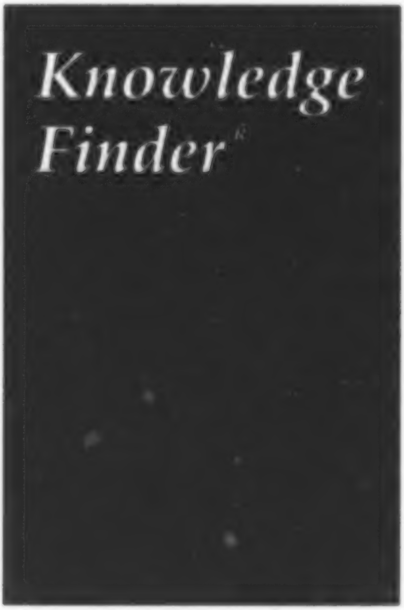

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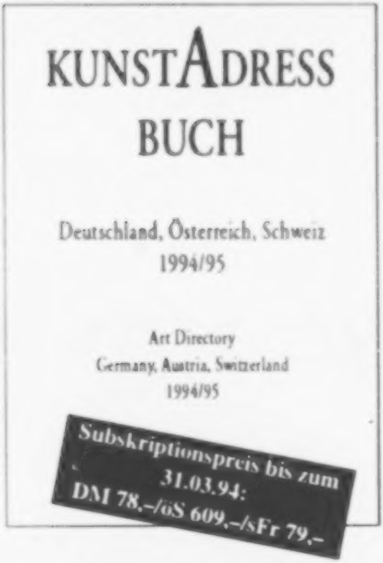

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